COPYRIGHT
2 1882
CLASS
OF WASHINGTON

NEW YORK REVIEW OF THE

TELEGRAPH AND TELEPHONE

AN ELECTRICAL JOURNAL.

AMES.

Vol. 1, No. 8. NEW YORK, JUNE 1, 1882. [$2.00 Per Annum. Single Copies, 10 Cents.

Copyright, 1882, by GEORGE WORTHINGTON. Entered at Post Office, New York, as Mail Matter of the Second Class

Songs of Our Land.

Songs of our land, ye are with us forever!
The power and the splendor of thrones pass away;
But yours is the might of some far-flowing river,
Through summer's bright roses or autumn's decay.
Ye treasure each voice of the swift-passing ages,
And truth, which time writeth on leaves or on sand;
Ye bring us the bright thoughts of poets and sages,
And keep them among us, old songs of our land.

The bards may go down to the place of their slumbers,
The lyre of the charmer be hushed in the grave,
But far in the future the power of their numbers
Shall kindle the hearts of our faithful and brave.
It will waken an echo in souls deep and lonely,
Like voices of reeds by the summer breeze fanned;
It will call up a spirit for freedom, when only
Her breathings are heard in the songs of our land.

Songs of our land, ye have followed the stranger,
With power, over ocean and desert afar;
Ye have gone with our wanderers through distance and danger,
And gladdened their path like a home-guiding star.
With the breath of our mountains in summers long vanished,
And visions that passed like a wave from the sand,
With hope for their country and joy from her banished,
Ye come to us ever, sweet songs of our land.

FRANCES BROWNE.

Some of the Beneficial Effects of Electric Lighting.

An English writer, after describing the baneful effects of gas lamps upon the healthfulness of living rooms, goes on to notice some of the mischief done to books, wares, furniture, and the like. The evil effects of the heat of gas jets is augmented, he says, by the large amount of water produced by the gas flame.

Sixty burners will produce on the lowest computation two gallons of water per hour; hence in a November evening many large shops filled with delicate goods will have a nine-gallon caskfull of water thrown into their atmosphere in the form of steam, to condense on any cool surface, as we often see it trickling down the windows in winter. But worse remains behind. The sulphur, always present in gas, in larger or smaller proportion according to the character of the coal employed, burns into sulphurous vapor, which passes in the air to the state of oil of vitriol. The eminent chemist, Dr. Prout, exposed water in a drawing room in which gas was burnt, and found that it absorbed sufficient of these vitriolic emanations to redden blue litmus and show the presence of free sulphuric acid. The fumes from gas will indeed, in the long run, discolor every sort of fabric, rust metal, rot gutta percha, and reduce leather (as in the binding of books) to "a scarcely coherent powder with a strongly acid taste." After referring to the evidence of the librarians of the Atheneum Club, London Institution, etc., as to the rotting of the bindings of books kept in rooms lighted by gas, the writer says: "Drapers know to their cost how the edges of pieces of dyed fabrics become faded and rotten when kept long on the upper shelves of gas-lighted shops; no plant will grow in a room where gas is burning, and cut flowers quickly wither; while those who work long and habitually in gas-lighted rooms become blanched and sickly. From all these manifold evils electricity will deliver us."

Light for Cars and Ships.

If it is true that a contractor can afford to furnish by electricity 150 lights a day for $10, then there can be no doubt that the cheapest as well as the safest light for shops and railway cars is that furnished by electricity boxed. It is said that but one sixtieth of the electricity stored on board the steamship Labrador on the day she left Havre for New York, April 30, was required to furnish light for the voyage which ended in this port on the 13th ult. There is reason to believe that the safety and comfort of travel, both by railway train and by ocean steamer, will soon be increased by the use of boxed electricity in place of oil and gas for lighting. It is possible, too, that the storage system will be found most practicable for the illumination of private houses in cities.

A Talk About Central Office Connections.

The central office is the terminal station of a great number of lines; there the subscriber's lines, after passing through suitable annunciators, are all united in a common earth plate, which is usually connected by a far too small wire with a gas or water pipe in a far too flimsy way.

The large city exchange offices are as a rule, at the present time well constructed in this respect, but in many of the smaller ones, there is much room for improvement.

We have said it often, but not too often; and here reiterate the maxim, that a central office main ground cannot be made in too substantial a manner; where the wire from the annunciator or the switchboard reaches the ground strip, it is usually fastened between a couple of washers, and tightened up by a machine screw. A very good way, provided it is done by a responsible man, but a three months' expert is very apt to turn the wire the wrong way round the screw, so that the more he tightens it up the looser it is. And when it is well tightened up, by a good man, it will bear frequent inspection.

The ground plate should not only be screwed to, but also soldered to the main ground wire, which ought to be copper wire, at least an eighth of an inch in diameter.

All those who have tried the experiment are of course fully aware that a large central office can be easily worked without a ground wire at all; and some who have worked in this way may regard the above advice as superfluous.

But there are two ways, a right and a wrong, to do everything; and where two ways seem to be nearly right, the best way is to take the *rightest*, and the rightest is generally the one which is a little the hardest; and therefore the one which the sons of Adam have the least preference for.

But you have, we will suppose, a good ground wire, and you have opened for business.

A call comes in—the annunciator drops, and you must respond to the said call and take the order.

How is the central office telephone to be connected?

We have to remember that both telephone and transmitter must be so disposed as to be easily connected with any one of a number of lines, and there are not many general ways of doing this.

Another condition is to be attended to. The subscriber will probably want to have his line united to another line, that he may talk through, with some other subscriber; and it is therefore somewhat requisite that the central office telephones must be so arranged that they can be easily connected so as to talk and listen with either or both of the subscribers' lines while they are united to another.

When the exchange business was new it was supposed to be quite essential, that to talk or listen with a telephone on any line, the telephone must be connected in circuit with that line, that is, that the receiving telephone coil would have to be made actually a part of the circuit, and if a transmitter were used, its secondary coil would also have to be inserted into the line circuit; and as a consequence the earlier switchboards were arranged with springjacks or keys, which allowed of such insertion. It is perfectly evident that this is the way that would first occur to any person taking the matter into consideration.

A springjack, as almost every one now knows, is a curved plate of brass or other metal, so placed over a flat plate or shoe, also of metal, that it tends to press down on the flat plate. It is adapted to be pressed away from the flat plate, by the insertion of a wedge. It has been utilized in this matter for many years to cut out and in, telegraph instruments, at way stations, and has also been much used at out telegraph stations to insert loops into a main line,

The wedge used for this purpose is two plates of metal separated by a layer of some non-conducting substance such as hard rubber; one of the metal plates connects by wire with one of the wires forming the loop to the instrument, and the other plate leads to the other side of the instrument or loop to be inserted.

Of course nothing was more easy than to substitute a telephone and transmitter for a key and relay; thus connected with a double surface wedge, the tele-

phones could be readily inserted in any line furnished with spring jacks for their reception; and this was not invention; it was the mere use of an old device for a new purpose; for the use of spring jacks and double wedges for the purpose of inserting loops or instruments in the circuit of a main line was first devised by Cooke and Wheatstone in 1837. It was, however, discovered that spring jacks and other looping devices cost money, and moreover with the kind of switchboard then in use, required the use of two connecting bars, one for each line ; and this took up increasingly valuable space; and casting about for some substitute for the looping in business, it was ascertained that attaching a telephone in a branch wire to the ground, to any line, or to any two connected lines, did not perceptibly interfere with the transmission of speech. This idea so far as applied to telephones was, we believe, original with R. G. Brown, then chief operator of the New York Gold and Stock Exchange, although it has been used in the fast automatic telegraph systems in England for a long time.

The discovery of the adaptability of such an arrangement to telephonic communication, gave a considerable impetus to the business, and aided in the construction of cheap switch boards, for all that was necessary was to connect in a switch board one or more either of the vertical or horizontal strips through the telephones to the ground, and to talk or listen, plug the line or lines, which it is desired to be in communication with, to the said telephone strip. This method for its sweet simplicity and cheap construction became very popular, and is at the present time more used than any other. It can also be arranged in as simple and cheap a way as the most economical exchange manager may desire; or it can be worked up expensively and highly finished. It may for example be constructed by having the telephone strip cross all the lines without touching, and enabled to make a temporary contact by means of spring keys over every line bar, each of which when pressed puts the line it is over in contact for the moment with the telephone bar.

There is one other way, and that is to connect the office telephones in derived circuit with the line, and theoretically this would seem to be the most perfect way. It is, however, not much used. Only one or two exchanges to the knowledge of the writer, have their telephones so rigged. It is done by interposing a resistance in the line circuit, and so fixing the apparatus that the office telephones may instantly by the pressure of a key or otherwise be made to bridge the resistance.

By adopting this plan, the disadvantages of both of the other plans are avoided, and the resistance need not be great—often the regular line annunciator will do.

The advantage of the loop plan is that when the telephones are inserted, they form no obstacle to communication, no matter how long the lines are connected.

The disadvantages are that the circuit is partially opened at the moment of insertion, producing a disagreeable click in the ears of the communicators, and often conveying the impression to the subscriber that his words are watched; and also that handling a long wedge is an awkward thing for the operator.

Recently, improvements have been made upon the loop plan by which the two open terminals of the telephone and transmitter loop are led across the line strips, and, by the insertion of a plug, brought into any desired circuit.

The advantages of the ground branch plan are, cheapness of construction in apparatus, easiness and convenience in application, and general utility; its disadvantage is that, when the telephone is attached at a point between a long line and a short one, it is apt to absorb too much of the talking current and place a bar to the communication; this may, however, be remedied in a great measure by the addition of a resistance coil in the ground branch—although a better way is to have a looping arrangement for the long-line connections.

The third plan seems to have all the advantages of the other two, and its only drawback appears to be complication; this, however, we should regard as being more imaginary than real, and we hope to see the method come into more extended use.

We regard the ground-branch plan as being well adapted for short circuits, as the connection should in any case be but momentary; and, if an exchange is fitted with apparatus connected on that plan for short-line connections, and with loops for long-line and mixed connections, the service will be good, provided the loops are invariably used when the said mixed connections are made.

It is part of our creed, that subscribers should all be taught to ring off, and even required to do so; and, to this end, the line annunciator or some other signaling device for that especial purpose should always be kept in the circuit of two connected lines.

We consider ringing off to be as much the duty of the subscriber as calling, in the first place; and though from sad experience we know it to be a task almost hopeless, to teach him that it must be done, we believe in perseverance and would never cease the attempt.

If necessary, it will be well to arrange devices whereby a signal may be automatically sent, when the telephone is restored to its place:

For the less the operator intrudes with the eternal hello! into the mysteries of private conversation between two subscribers the better for all concerned.

The Gulcher System of Electric Lighting.

Mr. J. R. Gülcher, of Biala, in Gallicia, is the author of a system of electric lighting, comprising a generator, a special form of lamp, and a mode of installation, which is being brought somewhat prominently under public notice at the present time, and has been for some months past in actual use at the works of Messrs. A. Ransome & Co., of King's road, Chelsea. The dynamo electric generator, is arranged with eight field magnets placed in two groups of four around a circle, one end of each being bolted to the frame, and the other ends being placed opposite each other. Each opposite pair of field magnets is provided with a wedge-shaped polepiece, the wider edge of which is curved, and the two are connected by a curved top plate. In this way the four pairs of magnets are coupled together, so that their polepieces form four trough like sectors of a circle, within which the armature revolves. This is a flat ring made of iron wire, around which the coils are wound something like a Gramme armature, but they are not continuous, the core being exposed between each coil. From the drawing it will be seen that the coils on the armature are brought within the magnetic field not only at their periphery but at the sides, so as to reduce the amount of idle coil as far as possible A peculiar feature in the machine is that the field magnets are wound with a copper rope formed of a double strand of thick wire.

The Gulcher electric lamp, which possesses several ingenious and highly practical details, attracted much attention at the Paris Electrical Exhibition last year by the steadiness of its light. Although it does not belong to the class devoid of regulating mechanism, such as the Soleil, Werdermann and others, it has no clockwork, and therefore may lay claim not only to great simplicity, but is also especially suitable for exposed situations where clockwork may become easily deranged. The regulation of the carbons is effected by a single electro magnet rendering the lamp very cheap to manufacture and repair, and not liable to become easily deranged.

Electric Railways.

It really appears to have come within the early probabilities that our railway system, as it exists at present, is to be revolutionized. A series of experiments resulted, as much as a year or two ago, in the construction of a short line at Berlin, the sole motive power of which was electricity. Now, it is being applied on a London street railway. In this latter instance, the car was fitted with a large number of Faure accumulators, ranged under the seats and communicating with a motor underneath, which, in its turn, by means of pinion-wheels, acted upon the wheels of the car. The accumulators having been charged at a dynamo-machine in the company's yard, a number of persons mounted the car and had a few runs with it up and down a quarter of a mile of the road to the amazement of the inhabitants, who, for the first time in their lives, saw a street car full of people traveling at the rate of seven or eight miles an hour without any visible motive power. As proving the applicability of electric force to locomotion, the experiment was an undoubted success. The same parties who has achieved this success with the London tramways (street railways) assert that the same principle applied to railway trains would enable a very high rate of speed to be attained—probably one hundred miles an hour—with driving wheels of moderate size. The promoters are, or profess to be, sanguine enough to believe that at no distant day they may be able also to introduce electric cabs and omnibuses guided like velocipedes. All vehicles driven by electricity could, of course, with a little additional expenditure of force, be lighted by the same means. It only remains to add, with reference to the electric tramcar, that it can be worked, started, stopped, and reversed by the moving of a small switch-handle, and that the promoters calculate upon being able to work tramways with electricity at one-half the cost of horse power. Now, when all these assertions come to be established facts, as seems to be by no means unlikely, and that, too, at an early date, what will be the effect on our railway system as it stands at present? A prodigious loss in the most expensive portion of the running plant will have to be certainly encountered. How much of this will be recovered by the greater economy of running trains by means of the new motor probably no one has yet taken the trouble to estimate. The effect on the passenger-traffic receipts, with a train running at one hundred miles an hour instead of at the present wretched score or twenty-five, it is also likely that no one has been so premature as to calculate. These are arithmetical conundrums which, nevertheless, seem not unlikely to exact early solution. And here we leave this branch of the subject, adding a few words on some of the possible effects likely to arise from the storage of electrical power. Some experimentalists, who happen to be at once enthusiastic and thoroughly practical, assert that anybody who chooses to put a windmill upon his house or barn will be able, by means of the secondary battery (a new discovery attributed to Messrs. Sellon and Volckmar), to light his dwelling at night, supply it with heat and hot water for washing and cooking, drive sewing machines, churns, washers, pumps, keep electrical carriages that will run anywhere about town without horses, do his plowing, draw mowers, reapers, seeders, propel boats, and perform almost any sort of work that may be required. The rotation of the windmill, running day or night, steadily or intermittently, costing nothing except repairs, will have its power stored up and held in the secondary battery, and by the touch of a button to be instantly delivered and put to use when wanted in the form of light, heat, or power. The battery forms in effect a reservoir of force, which when connected with an electrical lamp yields light, or with an electric machine yields heat or motive power. Furthermore, the battery is

quite portable, and may be placed in an ordinary carriage, giving motion thereto, like a locomotive. But there is no boiler to explode, and no fuel and water to be supplied. Women and children may safely use it. Every class of society, from highest to lowest, every art and industry in the civilized world, will benefit by its adoption. It is clear that modern science has got on the track of a discovery of incalculable importance. It may yet take some time to develop it to all the perfection of which it is capable. But enough is learned already to point to the probability that the revolutionary agency will be felt first, and last and most thoroughly by our great railway corporations.—*Shareholder.*

Electrical Storage Batteries.

The agents of the "Light and Force Company, of New York," an organization for the introduction of the Faure storage battery, arrived here this morning in the French steamship Labrador. They bring with them eighty large accumulators, or storage batteries, weighing 125 pounds each, and capable, when charged, of giving out power at the rate of one horse-power per hour, or at any slower rate that may be required, one tenth of a horse-power for ten hours, for instance. They also bring sixty-five smaller accumu'ators weighing forty pounds and capable of giving out one-third of a horse power for one hour. All these batteries were charged in Paris ten days before the Labrador left Havre, and have not been recharged since.

On the voyage over six Edison lamps have been lighted from the current from thirty of the large batteries coupled together, the light being, to judge from the specimens seen on board the Labrador this morning, of a steadier character than it is possible to get from a dynamo machine. The larger accumulators consist of wooden boxes twelve inches wide by twenty inches long and eight inches high, containing fourteen lead plates one-third of an inch thick, coated with minium or peroxyde of lead, held in place by a felt sheathing. The box is filled with a weak solution of sulphuric acid. Seven of the plates are connected to form the negative pole and seven to form the positive pole. To illustrate the saving in expense by using the storage battery for lighting instead of gas, an Otto gas engine was recently used to work a dynamo-machine, and the current stored up from the dynamo was used in an Edison lamp. The lamp gave, according to the agents of the new company, nine times as much light as the gas used in the Otto engine would have done if burned for lighting purposes. On the way from Havre no perceptible leakage of electricity in the batteries has been apparent.

The Faure patents were applied for on the 20th of April, 1881, and granted January 3, 1882. The plans of the company in this country are not sufficiently settled yet for it to be known under what agreements the batteries will be rented out to the public. It may be that they will be sent by wagon from house to house, one battery being replaced when exhausted; or a wire may be run from the central station to feed the batteries in any cellar with electricity; or in shops and buildings where there is steam power to spare the batteries can be charged from dynamos run on the premises. The agents of the company have offered to furnish the Labrador with dynamos, batteries and 150 lamps at $10 a day, the steamship's engines to furnish the power.

The new company makes no lamps of its own, and any lamp or motor may be used with the battery. One large battery will run a sewing machine ten hours a day for a week and will not cost more than a few cents to charge ag in, although of course the expense to the consumer will be larger. Stephenson, the street car builder, is making a car in which the batteries will be placed under the seats, less than one ton of batteries sufficing to run the loaded car at any speed for three hours.—*Ex.*

Matter and Magneto-Electric Action.

The very interesting lecture by Mr. Spottiswoode on the above subject incidentally throws light upon a phenomenon which probably has puzzled some other of your readers besides myself.

When a somewhat weak current is passing between the knobs of a Becker-Voss electro-induction machine, its passage can be altogether stopped by simply blowing across the path of the current. The handle is turned in vain; and even when the blowing has ceased, a short time is required before the current is able to pursue its old path. When the instrument has been warmed, and the current becomes stronger, the blowing, although now unable to stop the current altogether, drives it into irregularly-curved paths, which are determined by the force exerted. I do not remember to have seen the experiment mentioned in any book. It is as curious as it is simple.

We now see why the air requires to be at rest for the weak current to force a passage through it, and to keep that passage open for the succeeding sparks to follow; while the stronger current leaps from point to point, as though in pursuit of the warmed and opened passage which has been driven by the wind out of its former position.

HENRY BEDFORD.

All Hallow's College, Dublin.

Novelties in Photography.

To tourists desiring an easily taken pictorial souvenir of place visited, an arrangement lately described in *La Nature* should be welcome. It consists of a large opera glass which is readily transformed into a photograph apparatus. When this is desired, the object glasses (which are fixed similarly to bayonets) are detached and the eye-glasses unscrewed. For the latter photographic object-glasses are substituted, one of these being provided with a rocking shutter. For the object-glasses of the opera glass are substituted a photographic frame to hold a sensitised dry plate and a frame for ground glass, the former on that tube which carries the shutter. A screen before a circular aperture in the photograph frame is easily removed when the plate is in position by pressing a latch outside. To obtain the proper focus one screws the instrument till a good image appears on the ground glass; as the two tubes correspond optically, the plate adapted to the other tube is then in the right position. A momentary touch, by which the rocking shutter is displaced, gives sufficient exposure; the screen is replaced, the frame detached, the negative removed, and a fresh plate substituted. The shifting of plates within the frame is done with the hands within a bag impermeable to light, and having two bracelets of caoutchouc. The photographic apparatus should be steadily supported on some object (*e.g.*, a wall or a trunk of a tree) when a view is to be taken. The plates need not be developed at once, but may be kept for months before this is done. Simple directions for the process and for printing on paper are given. The various items required for this mode of photography are neatly packed in a small bag. A recent photographic achievement by M. Marey, is an apparatus which, pointed like a fowling-piece at a bird in flight, gives 12 pictures in a second, each picture having had an exposure of 1-700th of a second. The pictures, combined in Plateau's phenakistiscope, exhibit the flight of a bird in such a way that analysis is possible, and some interesting results may thus be looked for.

The Progress of Electric Lighting.

No one can have failed to observe the great increase in the number of electric lighting companies during the last few weeks, and one almost expects now in taking up his daily paper to see each morning the advent of some fresh system, each one in its advertisements trying to outvie its predecessor by the glowing terms in which its merits are set before the public. Whatever may be the ultimate success of these companies, the very fact of their ever-increasing numbers is sufficient to show that the general public is taking a very decided interest in the great problem of electric lighting. The recent development of these companies may, to some extent, be explained by the advertisement of the Commissioners of Sewers requesting tenders for illuminating various fresh sections of our city. This action on the part of the city authorities leads us to believe that they are in favor of having the principal thoroughfares lighted electrically, and, doubtless, such is the general feeling if the question of cost can be satisfactorily settled. If each of the six districts to be illuminated has a different system (which we hope will be the case), then the cost of each will certainly be more than what is now paid for gas. But if at the end of the experimental trials the Commissioners should think fit to adopt the system they consider best for the whole installation, then the electric light will have a fair chance of proving its superiority over gas, even when the question of economy is the main point at issue. Up to the present the area illuminated by any system of electric lighting has been very limited, and therefore we are very much in the dark as to its real value as an illuminant, economically speaking; but, like many other things, when the demand for it increases its cost will be lessened.

The display of the numerous methods of lighting by electricity at the Crystal Palace, and the visits of deputations from various public bodies to that center of attraction, has also contributed in no small degree to the activity now observable in this comparatively new commercial enterprise. It is very pleasing to electricians, and others who believe in the brilliant future of the electric light, to watch its development month by month—we might almost say now, day by day—and to note the amount of capital constantly being invested in the electric light companies, which must be very considerable. It cannot, however, be expected that all these new concerns which are so constantly cropping up are likely to be equally successful, nor is it probable that certain systems which have hitherto carried all before them can look for a continuance of such good fortune; and it is therefore very desirable that those wishing to obtain shares in electric light companies should carefully calculate the chances of the future before investing heavily in any particular one. The public, however, is not prone to look upon such matters from a scientific point of view, and if a report emanating from some authority states that a certain lamp gives a light intensity of 2,000 or 4,000 candles, as the case may be, it is looked upon as a first-class investment, the question of power consumed in the production of such a result apparently not entering into the calculation at all. Not only is this strange mode of comparing lamps common to the general public, but it is also a frequent question of those interested in the formation of companies, "What is the candle-power of such and such a lamp?" the idea that the candle-power may be made either great or comparatively small by the employment of more or less power never entering their heads.—*Electrical Review.*

The Mutual Union Telegraph Company has secured the privilege of an office on the floor of the Produce Exchange, and will open for business there at once.

NEW YORK REVIEW
OF THE
Telegraph and Telephone,
(AN ELECTRICAL JOURNAL)

PUBLISHED SEMI-MONTHLY AT 23 PARK ROW.

P. O. BOX, 3329.

GEORGE WORTHINGTON, - Editor and Proprietor.

SUBSCRIPTION.

United States and Canada, $2.00 per annum, in advance.

Great Britain and other foreign countries, 10 s., postage free.

ADVERTISING.

Transient rate, 35c. per line each insertion.
"Business specials," 50c. a line.

EDITORIAL ANNOUNCEMENT.

We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

Those desiring to recommend their goods can do so to any extent in our advertising columns, but we will not publish for pay anything of that nature in our reading columns.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

DEALERS SUPPLIED WITH THIS PAPER BY

The American News Company, New York.
The American News Company, Denver, Col.
The American News Company, Kansas City, Mo.
The American News Company, Omaha, Neb.
The American News Company, St. Paul, Minn.
The New York News Company, New York.
The National News Company, New York.
The New England News Company, Boston, Mass.
The Central News Company, Philadelphia, Pa.
The Western News Company, Chicago, Ill.
The St. Louis News Co., St. Louis, Mo.
The Cincinnati News Company, Cincinnati, Ohio.
The Detroit News Company, Detroit, Mich.
The Pittsburgh News Co., Pittsburgh, Pa.
The Baltimore News Company, Baltimore, Md.
The Rhode Island News Co., Providence, R. I.
The San Francisco News Co., San Francisco, Cal.
The Brooklyn News Company, Brooklyn, N. Y.
The Newark News Company, Newark, N. J.
The Northern News Company, Troy, N. Y.
The Albany News Company, Albany, N. Y.
The Montreal News Company, Montroal, Canada.
The Toronto News Company, Toronto, Ontario, Canada.

NEW YORK, JUNE 1, 1882.

CONTENTS.

Page.
Light for Cars and Ships.....113
A Talk about Central Office Systems. By T. D. Lockwood.....113 & 114
Electrical Storage Systems. Matter and Magneto-Electric action.....115
Novelties in Photography, Progress of Electric Lighting.....115
Paris Letter. By Prof. Geo. P. Grignard.....116
Lightning. By T. D. Lockwood.....117
New Form of Secondary Batteries. By Prof. Geo. P. Grignard.....118
Coal by Wire, Edison Electric Light, Carbon Electrodes.....118 & 119
Telegraphic and Telephonic Notes....119, 120 & 121
Miscellaneous Notes.....121 & 122
The Telephone a North Carolina Invention.....122
New Electrical Patents—U. S. and Great Britain, 123 & 124

We think our readers will be entertained by the valuable and instructive articles in this issue from both our Paris correspondent, Prof. Grignard, and our home contributor, Mr. Lockwood. The electric light and telephone people ought specially to peruse their interesting letters.

M. L. Lawson, an operator of Cedar Rapids, Iowa, who has made electricity a study for the past eight or ten years, claims to have invented a very powerful main-line sounder which dispenses with local batteries entirely. This sounder, though small, compact and peculiarly-constructed, has the power of several ordinary relays. The initial or down stroke of the lever is effected by the combination of seven powers, or forces—the double magnetic power of electric energy, the mechanical power of a double adjustable spring, which is so arranged as to give power to the lever in both the up and down stroke, and the natural power of the gravity of the lever itself; when once put in circuit it needs no further attention, which virtually makes it a self-adjuster. The above instrument will certainly be a great improvement over those now in use. The sounder can be made as cheaply, if not cheaper, than the relays now in use. Mr. Lawson is busily engaged perfecting the sounder in every particular. We hope to illustrate and give a more complete description of the above instrument very soon.

The experiment just successfully made of boxing electricity and sending it across the ocean, using it on the way for practical purposes of electric light, opens new possibilities in science and art. Mr. Faure's storage batteries not only held out during the twelve days, giving a light which is claimed to be as good as gas and cheaper than oil, but the poles were not recharged, and could have lasted several days longer. Thus it is clear that the costly and laborious storage process invented by Plante has been so improved by Mr. Faure that a really cheap and effective accumulation battery is at the world's service. The results must be very important; for, obviously, not only light, but force, can be carried in bulk and peddled at retail. It can be made to order in New York and sent by railroad or delivered by express wherever it is wanted. Perhaps in time it can be taken to the lonely Arctic, or the center of Sahara, and there used as if these places were stocked with steam machinery. In fact, when further improvements are made, it will probably carry itself along, and light its way in going, for it is likely to prove a practical motor, and may be used on the street cars of New York.

A Telephone Controversy.

Before Judges Lowell and Gray in the United States Circuit Court the case of the American Bell Telephone Company against Prof. Amos E. Dolbear, of Tuft's College, *et. al.*, came up. The complainants allege that the Dolbear telephone is an infringement upon the Bell patents, and move for an interlocutory injunction. The claim of the defence is that the two methods of telephoning speech are essentially and radically different, being based upon different electrical laws; that the latter uses the energy of the sound waves to control the electricity on a circuit, instead of converting that energy into magnetic variations.

Iron (London) says: "There are many articles in which several countries are a long way ahead of us. An example is to be found in the superiority of the tools which are now so largely imported into this country from America, and which while remarkable for their quality and finish, are much less costly than those of English production."

Dynamos in Multiple Arc.

Mr. Johnson has been running 12 Z dynamos in multiple arc at the Crystal Palace, also two Edison steam dynamos in multiple arc on the Holborn Viaduct, and he states they all work to perfection. This successful attempt to run two mammoth dynamos in the same circuit is an event of such scientific importance as to be entitled to especial mention. It was done for the first time on the night of April 8th, 1882, and took place under the direction of Mr. Johnson at the Edison Central Station, Holborn Viaduct, London, England.

From Our Paris Correspondent.

In your number of 15th April, I read an interesting article on Underground Electric Wires. Permit me to give you some information on the system and cables used by the Société Générale des Téléphones of Paris.

It is already well known that the cables are laid in the sewers and supported by iron hooks placed against the walls.

A cable contains 14 conductors, is composed of a strand of three highly conductable copper wires of $\frac{5}{10}$ of a millimeter in diameter each, surrounded by a layer of gutta percha which increases the diameter to $2\frac{3}{10}$ millimeters. It is then wrapped in colored cotton. There are two conductors of the same color, they being yellow, red, green, blue, brown, black and white. The 14 conductors are then enveloped in a white cotton band and placed in a lead pipe of $1\frac{1}{2}$ millimeter in thickness and $16\frac{3}{8}$ millimeters outside diameter.

The Société does not use the second or return wire for the present. All the wires in a central office have, therefore, the same earth or ground wire. The induction caused by such a system is not great and does not interfere to any serious extent with the conversations. The switchmen in the "centrals" are chiefly heard from induction by a subscriber when he calls, as the earth is then common to both; but when the subscriber is connected with another, the induction heard is very feeble as in this case the earth ends are far apart and distant from any other earths. However, the French Administration of Posts and Telegraphs has compelled the use of are turn wire. Nine out of ten offices are provided with double line switches and in a few months the return wire system will be in full operation.

I do not think it safe to work a magneto call in cables having a low insulation, as the high tension and quantity of electricity developed in these instruments is apt to make a connection between two wires at a given moment where the insulation is least. The Société here uses a direct battery current of 3 Leclanché cells, same battery serves for the microphone.

Speaking of batteries, I saw to-day at the Eastern Railway, a novel form of Leclanché. The zinc forms the outside cup and takes the place, therefore, of the ordinary glass jar. In the center of this cup, which is cylindrical, $5\frac{1}{2}$ inches high and $1\frac{1}{4}$ inches in diameter, is the ordinary retort carbon electrode, on the two broader sides of which is placed a plate of agglomerated peroxide of manganese. The cup is then filled with a mixture of lime and sal ammoniac in a semi-liquid state. The water evaporates, the cell becomes dry and ready for use. The electro motive force of this new model, the Daniel cell being 1,000, the ordinary Leclanché 1,400, is 1.342. The ordinary leaden cap on the carbon is done away with, the carbon has a hole at the side in which is placed a galvanized bolt which presses two plates of copper, an inch square, firmly against the carbon, the nut of the bolt acting also as binding post.

Lightning.

LOOK OUT FOR IT.

As the summer advances and the lightning storms may be expected, the exchange manager must look out for trouble following closely in the train of each storm.

Last summer considerable havoc occurred among the Blake transmitters, and many were the induction coils idealized by too close an interview with atmospheric electricity.

Comparatively few receiving telephones and bell magnets were so demolished; it is, however, likely that the mortality among all classes of telephonic helices may be greatly diminished by a judicious selection of apparatus, and by frequent and careful inspection.

In the matter of selection, it is not wise to purchase any magneto bell in which the local circuit is not entirely separated from the line when the telephone is on its support.

It is not probable that any bells are now made utilizing the main line circuit of the bell, as a part of the local transmitter circuit, but the older bells were frequently so made.

Many persons who have not been long in the business might, by the low prices asked, be tempted to purchase bells so arranged. To all such, we would say "Don't."

Again, never put up a bell without a lightning arrester. To be sure the little saw-teeth plates, with which our manufacturers adorn their bells, don't afford much protection to the square inch, but half a loaf is better than no bread; and, if the man who puts up the bell does his share, and unites the ground plate by a *stout* copper wire, without many sharp turns in it, to a water pipe, making the connection with the pipe of large surface, having previously brightened the pipe and finishing the job by soldering the connection, you can count the chances in your favor after all. Moreover, the inspectors should about this time keep their weather-eye open, and see that connections are all tight in and about the subscribers' offices.

The great difference between a man and a binding screw is, that a man is no good when he is tight and that a binding screw is no good when it is loose.

They should also see that the ground wires are in good shape, especially is this necessary where more than one office happens to be on one line. The temptation to omit the lightning arrester ground at the intermediate stations is in such cases almost irresistible. There are, it is true, many constructing linemen who are square and want to do their whole duty, and do it well, but man is but mortal, and with such a temptation, must not be too harshly thought of if he falls. If the lightning strikes a certain wire it of course does so with the laudable idea of going to earth by the shortest and quickest road.

If it has to go through intermediate offices to reach a terminal ground, and at those intermediate offices finds a good lightning arrester ground, some of it will probably jump the space and go to ground at those offices, instead of traveling through all the bell magnets to the ends of the line, pulverizing them *en route*. If it does not find lightning arresters with good ground wires, don't blame it if it burns up your bell magnets in traveling through them. The reason your ground wire should be straight is, that lightning travels at a tremendous rate of speed, and hence, like any other body traveling fast (an express train, for example), has a rooted distrust of its ability to successfully turn a sharp corner, and therefore does not generally try it, but goes straight ahead; therefore, if the inspector finds a crooked ground wire, let him take out the corners and, if it is impossible to make the wire straight, at least he may transform the corners into gentle curves.

The reason your ground wires should be large is, that atmospheric electricity, besides traveling under high pressure, travels in considerable volume, and wants plenty of elbow room. Therefore, if the inspector finds a No. 18 copper wire, he will do both wisely and well if he supersedes it by a No. 11 or No. 9.

The reason the ground wire ought to be firmly soldered to the water pipe is, that if the joint is not a good one heat will be generated there, just as heat is produced in an incandescent light, by the attempts of a large amount of electricity to pass over or through a hard place; and, therefore, to save trouble, it is concentrated wisdom to make first-class ground wire joints.

The reason—that to have a loose connection anywhere about your apparatus is like playing with dynamite and percussion caps on the top of a cook stove—is, that if lightning strikes your line-wire anywhere and comes into an office, it will very likely pass off quietly via the "ground wire," and "line out," provided the connections are in good order; but that if it finds a loose connection in its way, the continuity is interrupted and, as it must go somewhere, it is apt to smash the apparatus and break out into the room in its search for an easier way to the ground than the way through the loose connection.

To conclude, give lightning every facility to escape and it will let you alone, ninety-nine times in a hundred; obstruct it, and it will turn again and rend you!

A paper has been in circulation for signature by stockholders of the Western Union Telegraph Company, giving assent to the execution of the lease of the cables of the American Cable Company. Accompanying the paper is a synopsis of the lease, the terms of which have already been published. An additional clause provides for hiring a cable to Brazil at $300,000 a year, provided it shall be laid within five years.

A MADRID EXHIBITION.—An exhibition of the products of metallurgical and ceramic industry will be held at Madrid this month. Glass and minerals will also be included in the exhibition.

Favorable crop reports continue to pour in from the West and Southwest, and the pessimists are beginning to fear that a bread famine will not take place after all. This is too bad.

An Ohio newspaper was sued the other day for $10,000 damages for libel. The jury after a patient hearing of the evidence, gave a verdict for one cent. It is not altogether profitable to sue newspapers.—*Syracuse Journal.*

Yes, it sometimes happens that a man without any "character" to damage finds a lawyer in need of clients, who enables him to "try his luck" at a "vindication," "on shares," as it were. Such speculations sometimes turn out very disastrously to the venturers thereon.

THE JURORS AT THE CRYSTAL PALACE.—It is said that Messrs. Siemens and Swan have declined to have their electric light exhibits judged by the jury as now constituted.

An extra Territorial Line has just been completed on Buck Mountain, Pa., connecting Mauch Chunk, Pa., and Hazleton, Pa. It works beautifully. It is called the Coal Telephone Company. Homer A. Clute, Esq, is President; S. M. Gortright, Esq., Secretary and Treasurer; Horace A. Clute, Esq., Director.

Telephones in Mexico.

CITY OF MEXICO, May 26.—The privilege granted the Mexican Bell Telephone Company to sell and operate their telephones has not yet been approved by the Executive. Two American companies are actively at work establishing telephone exchanges.

Lieut.-Colonel Webber on the Telephone.

In lecturing before the members of the Society of Arts on "Telephonic Communication, Lieut.-Col. Webber touched upon several points worthy of reproduction. In referring to the report of the Count du Moncel, who acted as technical adviser to the International Jury of the Paris Universal Exhibition in 1878, the following passages are found in connection with the rival claims of Messrs. Gray and Bell for the invention of the telephone:

"1. That the two inventors had, at the same time, the idea of reproducing speech with the assistance of undulatory currents.

"2 That Mr. Gray was the first to discover the way to solve the problem.

"3. That Mr. Bell only succeeded after 'trials,' and these almost casually referred to in the last sentence of his claim.

"4. That the two inventors' systems are different, in that one uses a battery, while the other uses only the induced currents resulting from the use of a magnet.

"5. That while Mr. Gray was the first to solve the problem, Mr. Bell was the first afterwards to give it a practical and convenient form.

"6. That the invention of Mr. Gray gave birth to the telephone of Mr. Edison, which itself was the progenitor of the microphone."

The jury awarded on this evidence the highest honors to the three great discoverers, Bell, Gray and Edison. The lecturer then remarked that in such matters as these we find men forgetful of the past, even of their own statements made on evidence never contradicted, and he quoted the fact that in February last, the Count du Moncel published an article in *La Lumiere Electrique* on the discovery of the telephone, in which he bestowed all the honors as the inventor and discoverer of the telephone on Professor Bell alone. The Lieut.-Col. said that, so far as carbon is concerned as a means of acting as the mediatory for the emission of undulatory currents, its use is due to the discovery of Clerac some fourteen years ago, a discovery which is the foundation of that of all the carbon telephone transmitters.

Exhibition of the Electric Light.

On Friday evening, the 5th inst., we took the opportunity of viewing the installation of the London and Provincial Electric Lighting and Power Generating Company at the Atlas Works, Webber street, Waterloo Road. This company is formed for working the "British" incandescent lamp and the "Chertemps" arc lamp with the Gramme dynamo-electric machine. When we visited the works there were only twenty incandescent and three arc lamps, these latter, however, being worked only one at a time. Two Gramme machines were employed of the "A" type, driven from a 12 horse-power nominal Otto gas-engine, which, however, in this instance behaved so badly that we cannot criticise the behavior of the lamps. We may say, however, that we doubt the efficiency of the "Chertemps" lamp as compared with several other well-known and successful inventions. In our correspondence column will be found an important letter dealing with this company's prospectus, in reply to which we have fully dealt with the various points brought forward. We notice that in the description of the Chertemps lamp by the company's electrical engineer, and which is attached to the prospectus, it is stated that the lamp as described is intended to work singly, *but with proper modifications can be easily made to burn in series* (the italics are our own). We think that this report does not enhance the value of the lamp.—*Electrical Review.*

New Forms of Secondary Batteries.

Mr. N. de Kabath, who has the Maxim lamp in Paris, has just shown me a new form of secondary battery by which certain industrial qualities are given to the Plante accumulators, heretofore constructed of small dimensions and their total weight not being over eleven pounds, a weight and size altogether in-

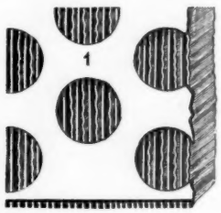


FIG. 1.

sufficient to store a large quantity of electricity. Batteries of 130 pounds are now made and there is no objections to use an accumulator weighing several tons.

The problem to resolve was to construct a battery as light as possible and at the same time giving a large power of accumulation. The result was obtained in goffering the lead sheets and in reducing their thickness to one-tenth of a millimeter,* thus increasing their *active* surface and at the same time diminishing their weight. The feeble thickness of the sheets is however quite sufficient as it is only on the surface that the reaction, yielding the secondary current, is produced, the layer of peroxide of lead being extremely thin.

Let us describe the battery and see how a large surface has been obtained without increasing the weight in proportion. The battery is composed of a series of blades, an interior disposition of which is given in Fig. 1. Each blade is composed of a series of lead strips of one-tenth of a millimeter in thickness and of an appropriate length. These little strips of lead are alternatively goffered and flat, and are juxtaposed to finally form a sort of partitioned blade of about 3 to 3½ inches in width and enclosing from 80 to 100 strips. They are then enveloped firmly together by a thicker strip of lead pierced with holes, (Figs. 1 and 2), to allow the free circulation of the liquid. To each of these blades thus prepared is fixed a metallic conductor which serves to connect it to its corresponding binding post.

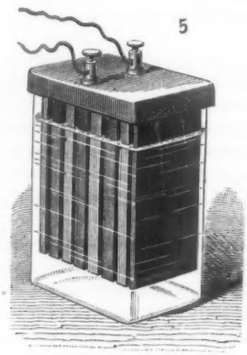


FIG. 2.

The vertical model (Fig. 2), is composed of 12 such blades, 15 inches high, 3¼ inches wide and half an inch thick, connected alternatively to one binding post and to another. The two extreme blades are simple sheets of lead, bringing the total number of blades to 14. They are strongly fitted in the lid at the upper part, and held at the bottom by an insulating cement made of hard rosin and paraffine. The box is of wood lined with lead; this does away with the ordinary glass jar, the latter being used only for experimental batteries not weighing over 22 lbs. (Fig. 3).

The weight of the battery is 66 lbs. with the blades only and about 77 lbs. with the liquid, *i. e.*, 90 parts of water and 10 parts of sulphuric acid.

In the model for laboratories (Fig. 3), the blades are smaller and only six in number. They are placed in a glass jar for the purpose of studying the effects of the charge and discharge.

The horizontal model (Fig. 4) has only ten blades and weighs only 55 lbs., it is more frequently used as a fixed battery. The blades are held at their extremities by the insulating cement when this is being done each blade is separated by a small board which is taken away when the cement is hardened (Fig. 5). The binding posts are on the side of the box; the batteries can thus be placed one on top of another.

*About 275 sheets to make an inch in thickness.

The electro-motive force is equal to 2,200, taking the Daniell cell as unit.

No one can give his opinion in regard to these new forms of secondary batteries, as they have not been long enough on trial. However, as they are similar and reposing on the same principle as the Plante accumulator, they present at least all the good qualities, and possess moreover the industrial qualities which were lacking in the latter, constructed only in view of scientific researches.

GEO. P. GRIGNARD.

Paris, May 16th, 1882.

Destruction of Carbon Electrodes by Continued Electrolysis.

Bartoli first observed that the quantity of gas generated during the electrolysis of water at the positive pole was comparatively too small, that is, less than half the volume of gas collecting at the negative pole, when this positive pole consisted of carbon. The loss could be explained by a combination of the delivered oxygen and the carbon. In connection with M. Papasogli, then, M. Bartoli further studied the matter, principally to ascertain what organic bodies would result under these circumstances. As such they determined mellitic and hydro-mellitic acids. Their experiments are, however, not less instructive from another point of view, as they show that the use of carbon as a positive electrode finally ends in the total destruction of the solid carbon. A fine powder soon collects at the bottom of the voltameter, and the liquid itself becomes more and more colored, not from sensibly suspended particles of carbon, as might be presumed, because repeated filtering and keeping the liquid undisturbed for months does not produce any change in the color. Distilled water as well as diluted solution of nitric, sulphuric, acetic, oxalic acids, of potash, soda, and some carbonates, were tested with pretty similar effects. Of the three sorts of carbon employed, graphite, gas carbon, and charcoal, the two latter are used somewhat quicker. One piece of carbon electrode was totally destroyed in 29 days, with 100 Bunsen elements acting for four days, 40 elements for five, and 20 elements for 20 days. Carbon may, on the other hand, be used as a negative electrode without any risk, a distinct proof that we have to deal with an oxidation process.

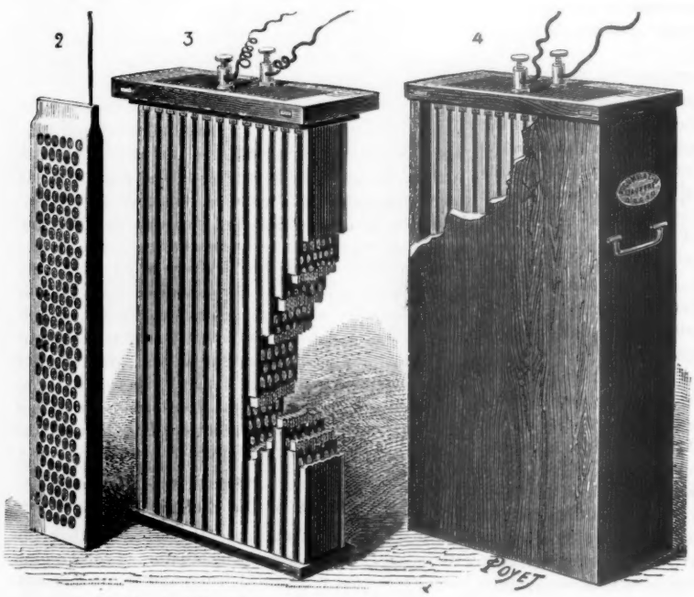


FIG. 3.

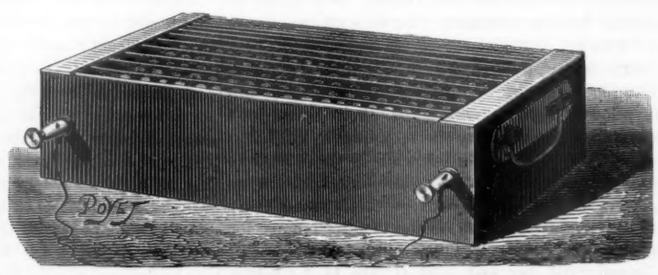


FIG. 4.

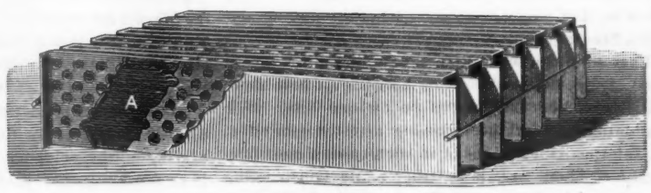


FIG. 5.

Coal by Wire.

The proposal of Sir Henry Bessemer to bring coal by wire, instead of by rail, is very simple. Although coal is still our great agent in the production of motive power, it must not be forgotten that Sir William Thomson has clearly shown that by the use of dynamo-electric machines, worked by the falls of Niagara, motive power could be generated to an almost unlimited extent, and that no less than 26,250 horse-power so obtained could be conveyed to a distance of 300 miles by means of a single copper wire of half an inch in diameter, with a loss in transmission of not more than 20 per cent., and hence delivering at the other end of the wire 21,000 horse power. Sir Henry exclaims, "What a magnificent vista of legitimate mercantile enterprise this simple fact opens up for our own country! Why should we not at once connect London with one of our nearest coal fields by means of a copper road of one inch in diameter and capable of transmitting 84,000 horse power to London, and thus practically bring up the coal by wire instead of by rail?" He supplies the equivalent in coal of this amount of motive power. Assuming that each horse power can be generated by the consumption of 3 pounds of coal per hour, and that the engines work six days and a half per week, we should require an annual consumption of coal equal to 1,012,600 tons to produce such a result. Now, all this coal would, in the case assumed, be burned at a pit's mouth at the cost of 6s. per ton for large and 2s per ton for small coal—that is, at less than one-fourth the cost of coal in London. This would immensely reduce the cost of electric light, and of the motive power now used in London for such a variety of purposes, and at the same time save us from the enormous volumes of smoke and foul gases which this million of tons of coal would make if burned in our midst. A 1-inch diameter copper rod would cost about £533 per mile, and, if laid to a colliery 120 miles away, the interest on this at 5 per cent. on its first cost would be less than 1d. per ton on the coal practically conveyed by it direct into the house of the consumer.—*Iron.*

The Edison Electric Light.

Mr. Johnson, as representative of Mr. Edison in this country, delivered a lecture in the Concert-room of the Crystal Palace on Wednesday evening, the 3d instant, his object being to explain, in a popular manner, the entire Edison system of production and distribution of electricity for lighting and motive power. He alluded to the phonograph as being the invention which brought Mr. Edison's name prominently before the public, and said it was not till 1878 that his thoughts were turned to the subject of electric lighting. In reference to the reports in the newspapers at that period and the great panic and dealings in gas shares, he declared that Mr. Edison had no share in such transactions, which occurred without his sanction. Speaking of incandescent electric lamps, the lecturer went on to say that he would not enter into the question of legal rights generally, as the courts of law could only settle that, but he might safely state that no one had ever accused Mr. Edison of appropriating the invention of any other person. In his remarks on dynamo-electric machines, Mr. Johnson said large machines must necessarily be employed for public purposes, and he expected one shortly from America which would keep 2,600 lamps going at once. To be economical—the most important point commercially—no current must be wasted, and therefore the only way of connecting the machines and lamps was in multiple arc, thus securing the individuality of each lamp. Although in series less copper was required for conductors, that plan was as expensive as ever when the lamp went out—the same current had to be sent through the line, and the consumer had to pay for it, whether he needed the light or not. He claimed for Edison's system, in its entirety, simplicity, economy, perfect safety, both from danger of fire and accidents to human beings, more freedom from trouble even than gas, and that with the electrolytic meter the consumer would only pay for the exact amount of current passing through his circuit; also, by an automatic resistance at the central station, the lamps in the whole circuit or district are kept at a regular candle power. Mr. Johnson concluded his lecture with a few observations on Edison's electric railway.

A New Telephone.

At a recent meeting of the Society of Telegraph Engineers and Electricians, Professor Dolbear, of Tuft's College, Massachusetts, United States, delivered a lecture upon a new kind of telephone receiver invented by him and recently introduced into this country. The lecturer reviewed the past history of telephony and stated some new facts in connection therewith. For example, he showed that after the labors of Page in the production of "galvanic music," by making and breaking the circuit of an electro-magnet, a New Englander named Farrar made the first attempt to transmit the human voice. By means of a receiver similar to that of Professor Bell in principle, he succeeded in transmitting the notes of vibrating tuning forks, but gave up his vocal experiments because an eminent scientist of the day advised him that it was hopeless to expect to telephone speech. Professor Dolbear also showed that Reiss, the inventor of the musical telephone, made a receiver consisting of an electro-magnet, having in front of its poles a vibrating armature of soft iron. The receiver of Dolbear is entirely different from those of Bell or Edison and depends on the static attraction of one electrified metal disc for another disc placed very close to it. One of these discs is fixed, while the other is free to vibrate, and to get the static attraction powerful enough to vibrate the free plate or disc an induction coil is inserted in the circuit between the line and the telephone. The vocal currents coming from the distant transmitter, which is preferably a microphone, are passed through the primary wire of this coil and the intenser secondary currents are applied to the free plate. As they vary in strength in accordance with the undulations of the voice, the attraction between the two plates varies also, and audible vibrations corresponding to the regulating voice at the other end of the line are given out through an ear-piece to the listener.

It is not necessary to have a wire connecting the fixed plate of the telephone to the earth, for the person of the listener as he holds the telephone to his ear is itself a sufficient connection. Moreover, as Professor Dolbear showed, to the surprise and pleasure of his audience, it was not even necessary to have a wire connecting the free plate to the induction coil, provided the listener did not go many yards away from the coil. Induction through the air from the poles on the coil was sufficient to cause the telephone to speak. Thus a number of persons could hear a message without any connecting wires to the telephone whatsoever. The effects are, however, much louder when the two plates are properly connected, the one to the line through the secondary of the induction coil, and the other to the earth or a return wire. We may mention that at the last meeting of the Physical Society, Mr. Shellford Bidwell exhibited a new telephone transmitter, which consists of a thin layer of fused sulphur mixed with graphite. This layer is threaded by convolutions of a fine platinum wire wound round a thin plate of mica, after the manner of Mr. Bidwell's selenium cells, and on connecting it in circuit with a battery and telephone and speaking against the mica plate, the speech will be audible in the telephone.—*Inventor's Record.*

Statistics of the Telephone Business in Michigan—Twenty-five Exchanges now in Operation, and Over Four Thousand Instruments in Use—Connecting Lines now Built and in Contemplation.

It is less than five years since the first electric telephone was put into operation in Michigan—a fact that seems hardly possible when the vast proportions to which the business has already grown is considered. The pioneer line in this State, we believe, was first put up in September, 1877, between Stearns' drug store and laboratory in Detroit. Others followed rapidly, and, as the great utility of the new invention became apparent, the demand taxed the telephone companies to the utmost in the manufacture of instruments and construction of lines.

The exchange system seems to have been first thought of several months later; and not until August or September, 1878, was the first attempt made to bring together in a central system some of the business men of Detroit who were already using telephones. The number was very small at first, but rapidly increased. Several months later exchanges were established at Saginaw, Bay City and Grand Rapids, and in the fall of 1879 the exchange at Muskegon went into operation. In the meantime, great improvements had been made in telephone apparatus, the most important being the Blake transmitter. In October, 1879, the first steps were taken towards establishing an exchange in Port Huron, and it was put into operation January 1, 1880, being the sixth in the State. The subsequent growth of the business in Michigan is shown by the following list of exchanges, with the number of subscribers May 1, 1882:

Exchanges.	Number of Subscribers.
Adrian	72
Alpena	60
Ann Arbor	60
Bay City	197
Big Rapids	51
Detroit	1,061
East Saginaw and Saginaw City	277
Flint	76
Grand Haven	88
Grand Rapids	342
Jackson	178
Kalamazoo	70
Lansing	89
Ludington	56
Manistee	69
Menominee	24
Montague	44
Muskegon	177
Mt. Clemens	25
Niles	38
Port Huron	114
St. Clair	18
St. Joseph	33
Three Rivers	38
Ypsilanti	66
No. of exchanges, 25.	No. of subscribers...3,323

The total number of sets of telephones leased for use on private lines in Michigan, May 1, was 700, making a total number in the State of 4,023, exclusive of those used in the central offices of the exchanges.

It will be noticed that the Port Huron exchange stands seventh on the list in the number of subscribers. The system with which Port Huron is connected (Detroit, Mt. Clemens, St. Clair, Marine City, Marysville, Roseville and Leeseville), had a total of 1,223 subscribers May 1, independent of the exchange at Windsor and other Canadian points south of Detroit.

All the exchanges in Michigan are owned and operated by the Telephone and Telegraph Construction Company, of Detroit, which holds the exclusive li-

cense from the American Bell Telephone Company, of Boston, to lease telephones in this State. Beside the exchanges above noted, this company also owns and operates the following connecting lines:

Flint and Flushing Line.—Length twelve miles. Offices Flint and Flushing.

Niles, Buchanan and Berrien Springs Line.—Length sixteen miles. Offices Niles, Buchanan and Berrien Springs.

Kalamazoo and Galesburg Line.—Length nine miles. Offices Kalamazoo and Galesburg.

Fowler and Maple Rapids Line.—Length nine miles. Offices Fowler and Maple Rapids.

Kalamazoo and Plainwell Line.—Length twelve miles. Offices Kalamazoo and Plainwell.

The Michigan Bell Telephone Company, of Detroit, holds the license to build and operate outlying lines, or lines between exchanges, and has now in operation the following:

Detroit and Port Huron Line—Length of line seventy miles. Offices, Detroit, Leeseville, Roseville, Mt. Clemens, Marine City, St. Clair, Marysville, Port Huron.

Grand Rapids and Montague Line—Length of line 68 miles. Offices, Grand Rapids, Wolf's Mill, Lamont, Eastmanville, Grand Haven, Muskegon, Montague.

Fremont Centre and Newaygo Line—Length of line nine miles. Office, Fremont Centre and Newaygo.

The figures given above make a complete showing of the telephone business in Michigan May 1, 1882. Its growth within five years has been most remarkable, and its influence on the manner of transacting business in the cities and towns where exchanges have been introduced has amounted almost to a revolution. The business, however, is still in its infancy, and is increasing at the present time with greater rapidity than ever before. Many new exchanges will doubtless be established in Michigan during the present year, and a large number of long lines will be put into operation. Those now definitely decided upon and in process of construction by the Michigan Bell Telephone Company are as follows: From Detroit to Toledo by way of Monroe; from Detroit to Dexter by way of Wayne, Xpsilanti and Ann Arbor; and from Ann Arbor to Adrian by way of Saline and Tecumseh. All of these lines will be put into operation within the next three months.

The officers of the two companies are as follows:

President—Geo. W. Balch.
Secretary and Treasurer—Hugh McMillan.
General Manager—W. A. Jackson.
Superintendent—E. F. Phillips.
Cashier—Geo. A. McKinlock.—*Port Huron Times.*

Telegraphic and Telephonic Notes.

Notices have been sent to the subscribers to the fund of the American Cable Construction Company that the subscription has been closed, and that by surrendering their certificates of payment on and after June 5, they will receive for every $100 paid in two shares of American Telegraph and Cable Company stock, with 5 per cent. per annum from June 1, payable quarterly, guaranteed thereon by the Western Union Telegraph Company.

Agreement between the Cable Companies.

The four cable companies have agreed to pool their earnings. The American Cable Company, which is to receive 22 per cent. of the total receipts, is then to be leased to the Western Union Telegraph Company for fifty years at a rental amounting to a guaranty of 5 per cent. per annum on $14,000,000 of American Cable stock. The estimated net receipts of the American Cable are $1,200,000 per annum, which will cover the $700,000 guarantied by the Western Union Telegraph, and leave a profit to the latter company of $500,000 per annum. The American Cable Company has about $600,000 cash in its treasury which will go to the Western Union. It is expected that the order to double cable rates (which does not apply to press dispatches) will reduce the volume of business about 25 per cent., but that the business will then yield the figures given. In the proposed lease of the American Cable to the Western Union Telegraph there is a clause providing for a guarantee by the Cable Company of $300,000 per year for the lease of the cable to Brazil when completed.

Senator Daly's bill to compel telegraph companies to put their wires under ground in cities was ordered to a third reading in the Senate on 16th ult., with two amendments—one limiting the operation of the law to New York and Brooklyn, and the other giving the telegraph companies until 1885 to complete the work of putting the wires underground.

The annual meeting of the shareholders of the Mutual Union Telegraph Company was held yesterday at the office of the company, No. 135 Broadway. The Jay Gould ticket was unanimously elected. Of the old directory, John G. Moore, George F. Baker, George W. Ballou, George H. Holt, and Charles F. Peck were retained. Mr. Gould himself headed the list of new members of the Board, followed by his son, George J. Gould, Russell Sage, George S. Scott, H. C. Fahnestock, and G. G. Haven. The Board of Directors will meet on Thursday, when it is understood Mr. Moore will be chosen President of the company, Mr. Ballou Vice-President, and Mr. Peck Secretary.

Telegraph Communication A ong the Rhine.

The German Government has decided to establish telegraphic communication along the Rhine, between Huningen and Strasburg, in order or organize an efficient service in case of any overflows of the Rhine. This new line will be constructed as soon as possible.

Underground Telegraph Cables in France.

La Lumière Electrique states the following:

"Great progress is being made in the north of France with the laying of underground telegraph cables. The underground line is already established between Paris, Saint-Quentin and Cambrai. To proceed safely with the repairs of these lines in case of interruption, 'marmites,' a kind of test boxes, are placed at intervals of five hundred metres when the line is straight, but closer together at all places where there are curves in it. These boxes serve at the same time as so many mark points on the line. The placing of these boxes is so well arranged that, from a telegraph station, which is in communication with the underground cables, it is very easy, if necessary, to find out to what box the workmen should proceed to repair a broken wire. The length of the core or cable which the workman then pulls out will show him exactly where he should begin to dig in order to repair the line. These underground cables are not intended to replace the overhead telegraph wires; they are not even to be used for private telegrams. For the present the Government keeps them at their disposal. The network of underground telegraph lines which is now being laid from Paris to Lyons, and to Marseilles, will cost not less than forty-two million francs. On nearly the whole of the lines from Paris to Lyons the work of pulling the cables through the pipes is now being carried out. This is done by means of a wire rope left in the pipes when they are laid in the trenches. Three cables, wound on drums, and having each three conductors, are thus pulled through the pipes. We were in hopes that the underground line between Paris and Lyons would be ready by the 1st of May, but unfortunately the work is delayed."

Axle Telephone.

C. Resio, referring to an arrangement which he laid before the French Academy in 1880, announces that he has contrived a new apparatus which may be applied to any machine by a suitable modification of the transmitter, and by which a single observer, placed at any distance from the machine, may measure the torsion and the angular speed of the motor axle, and, in consequence, the work of the machine. The principle upon which the invention is based is thus announced: If, in a circuit containing a battery and a current interruptor capable of giving a sound there are two identical coils, A, A', arranged in tension, the one to the right and the other to the left, the induction currents excited in two other cells (induced), B and B', equal in every respect and connected in tension in a circuit containing a telephone, destroy each other, and in consequence the telephone will be silent if they are equidistant from the inducing coils, A, A', but it will emit a sound if the distances are unequal.

Telegraph and Telephone.

Parliament has interposed to interpret the meaning of these words. Its action comes in the shape of a statute, the whole substance of which, apart from the preamble, is as follows: "The word 'telegraph' and its derivatives wherever they occur in any Statute of the Dominion of Canada, or of any province now forming a portion of such Dominion, or in any letters patent issued, or contract or agreement made or entered into in such Dominion or in any such province as aforesaid, are not to be held or construed to include the word 'telephone' and its derivatives." This act applies only to any statute, letters patent, contract or agreement dated before January 1, 1878.

Decision in a Telephone Case.

In the House of Commons on May 19, Mr. Fawcett, the Postmaster-General, announced that the Government had no intention of purchasing telephones.

In the Chancery Division of the High Court of Justice, Justice Fry gave judgment in the case of the United Telephone Company against Walker, an action to restrain the defendant from infringing on the patent for Edison's transmitter and Bell's receiver. The former point was decided against, and the latter in favor of, the plaintiff. Shares have, in consequence, fallen heavily. Justice Fry's decision against Edison's transmitter patent is based on the ground that the specifications of the patent are too general to be valid under the British statutes.

Telephones Without Wires.

Mr. Willoughby Smith, the electrician of the Telegraph Construction and Maintenance Company, has lately made a discovery, the ultimate effect of which it is not, perhaps, safe to speculate upon, but which can hardly fail to affect in a very important degree the future possibilities of the telephone. Most persons are by this time more or less familiar with that instrument. It consists broadly of two little instruments—one for transmitting a sound, the other for receiving it, connected by a length of conducting wire, which has hitherto been deemed absolutely anessential. Mr. Willoughby Smith has made the startling discovery that the receiving instrument may be used without being connected with this conductor. We had recently an

opportunity of verifying this singular fact at the company's manufactory, situate at Wharf Road, City Road, where the cores of the cables are made, and of which establishment Mr. Smith is the manager. The apparatus at present consists of substantially the component parts of an ordinary telephone—a transmitter, a conducting wire and a receiver. The transmitter is a simple form of microphone, with the addition of a tuning fork, which may be kept vibrating so as to produce a clear musical sound. This is adopted merely as the most convenient form of the thing. It should be understood, however, that any other sound might be substituted for that of the tuning fork with similar results. This part of the apparatus is placed in one room and shut down in a box. The conducting wire from it is carried away to another room and attached to a large magnetic coil, mounted in a wooden frame three feet square, and standing perpendicularly like a fire screen. This spiral wire is placed on the table, and, so far as the unaided ear can judge, is quite silent. But on putting an ordinary telephone receiver to the ear—this receiver being, it must be understood, quite detached—the sound of the tuning fork in the distant room instantly becomes clearly audible. It can be heard in any part of the room, and more than this, the mere fact of the room having walls, seems to be of no importance to the electric power, the sound being distinctly audible outside, though, in order to become so, it must, on the occasion of our test, have passed through a thick wall and a large pier-glass. A second coil of insulated wire, mounted similarly to the first, but smaller in size, when placed parallel to the larger one, intensifies the sound immensely, though it has no appreciable effect when turned round at right angles with the larger coil.

What may be the practical value of this discovery remains to be seen, but it would have been well worth while to have made it, if for no other purpose than to have afforded perhaps the most striking illustration ever yet afforded of the marvelous divisibility, or rather, diffusibility, of the electric power. A small battery, just sufficient to keep a large tuning fork vibrating, and to send a current through the tiniest of conducting wires to a room at a short distance, is sufficient to fill that distant room with such an electric power as will reproduce the original sound on a telephonic receiver in any part of it, and even outside of it; and if the room were filled from floor to ceiling with telephone receivers, it would vibrate every one of them. This gives an idea of an electric atmosphere perfectly marvelous in its tenuity and its power, and so far as we are aware, it has never been so exhibited before. Experiments in connection with this have placed the telephone itself in a very curious light. It really seems as though the theory upon which the instrument has been so successfully constructed is erroneous in at least one of its fundamental principles. It has been assumed that conducting wires were necessary to carry a current through the "field" of a magnet, and that the sound was produced by the vibrations of a thin disc of sheet iron. The wires, as we have seen, are not essential, and we distinctly heard the sound of that distant tuning fork through a telephone "receiver" deprived of everything but the central magnetic bar, and the little wooden cup to fit over the ear. More than this, a large iron bar, when held near the center of the spiral wire, but without touching it, conveyed to the ear at the other end, the very faint but very distinct note of the tuning fork. The actual utility of the discovery is, as we have intimated, a matter for the future to determine and develop, but one or two of the possibilities it presents are very readily apparent. Looking at that screen of coiled wire covered in with brown paper, it is easy to imagine a similar one got up in the form of a handsome drawing-room fire-screen, or a mirror, or anything else of an ornamental character, which shall not only be handsome in appearance, but shall diffuse throughout the apartment the richest harmonies or the most enchanting melodies from some distant orchestra, and which any one may hear by simply applying to his ear a little instrument just large enough to cover it. We may thus have our rooms suffused with music precisely as we are accustomed to have them suffused with the odors of flowers. *Inventors Record*, London.

TELEPHONIC CABLES.

Local Progress Towards Underground Conduits in Pittsburg, Pa.

The growth towards perfection in underground electrical communication is interesting to every intelligent reader. The single telephone which was brought to this city as a curiosity in 1876 has multiplied until to-day 1,300 of these instruments are connected with the system whose heart is located at the First National Bank building, this city. With the rapid growth of this invention there have arisen difficulties unforeseen at the start. The multitude of wires called for a forest of poles, and these have sprung up in such numbers as to amount to a nuisance past tolerance in this city of narrow streets, already lined with fire-alarm and electric light and telegraph poles. The only hope for the future lies in underground conduits for electricity which shall take the place of overhead wires and unsightly, obtrusive poles. The local inventions which have been put forward in this matter, were detailed recently in the columns of *The Telegraph*. Each and all of these have more or less merit, but according to those best informed on the subject the more serious stumbling blocks have not been surmounted satisfactorily in any of these, or any other known device. The electrician of the Central District and Printing Telegraph Company, controlling the telephone system of this vicinity, was called upon to-day and asked what progress had so far been made towards laying underground wires.

"We have done nothing as yet," was the gentleman's reply; "but have several devices under consideration which promise well. The great trouble lies in this thing of providing for the tapping of an underground line, as needed by new subscribers. Where we wish to connect main offices a cable or conduit is a capital affair. There is a lead-encased cable now doing duty over the Point bridge, a distance of 1,250 feet, and it works all right. The lead pipe contains twenty copper wires imbedded in paraffine and wrapped in cotton. It works excellently."

The gentleman showed samples of other cables under consideration, including that of Mr. R. S. Waring, of this city. Two samples showed in their cross section a multitude of fine copper wires, 150 of these being packed in a lead pipe ⅝ of an inch in diameter, and none of the wires being thicker than a good-sized needle. One sample had a larger copper wire as a core, which served, not as a passage for the electric current, but as an outlet for the bane of all electric communication, induction, this wire being grounded at either end of the cable. In none of these cables or pipes could the wires, however numerous, permit the conduit to be tapped at points along the route. This obstacle is a serious one, but it would be rash to assume that it is insurmountable. As yet no conduits have been laid for telephonic communication in this city.

Boston and Northern Telephone Company.

The company which has recently bought out the "Boston and Northern" already owned the exchanges in the State of Maine and through central Massachusetts, so that now they control all the lines in Maine, New Hampshire, Vermont, and the greater part of Massachusetts, including some 12,000 subscribers. The capital of the company is over $1,000,000. J. D. P. Wingate, Esq., of the Exeter *Gazette*, has been appointed superintendent of the Exeter, Dover and Portsmouth Division, which includes Durham, Rochester, Newmarket, So. Newmarket, Great Falls, Salmon Falls, Hampton, North Hampton, Epping, Rye, Kittery, So. Berwick and Farmington. The management in Dover will remain the same, Mr. C. A. Richmond assisting the superintendent in the discharge of his duties here. In order to give still better accommodations at the Dover exchange, it has been thought best to allow one free communication between the Dover subscribers and those in Great Falls and Salmon Falls, the latter now in process of connection with the central office. This order will go into effect in a few days, but it must be understood that this free communication is for the use of the subscribers only, and messages to and from outsiders will not be sent except at regular rates. Subscribers wishing to communicate with any one in Great Falls and Salmon Falls not connected by telephone must pay the regular rates. The company will at once build new trunk lines to Boston, Manchester, and other points. In less than three months, under the present successful management, they expect to see the Dover exchange largely increased in its business importance. A new list of subscribers for this division will be issued at once. The Dover exchange is said to be the best managed of any this side of Boston, and those of our citizens who have telephones appreciate the addition of Great Falls and Salmon Falls to the list of working offices, with which they may now communicate without charge. This desirable state of things has been brought about through the efforts of the managers of the Dover Division.

Successful Laying of a Sub-Aqueous Cable between McGregor, Iowa, and Prairie du Chien, Wis., by the I. & M. Telephone Co.

With characteristic promptitude, the management of the Iowa & Minnesota Telephone Company decided to lay a 4 wire wound cable between our towns, and on recent visits to New York, Boston and other points, the President of the company, Mr. J. M. Griffith, gave the matter of cables considerable study, and the present cable was ordered. Every possible electrical appliance which would contribute to the success of the cable was procured. The immediate charge of laying the cable was conducted by General Manager, E. T. Keim, assisted by George E. McFarland, Supt., calling into requisition the skill of Mr. James Lawler, Superintendent of the pontoon; also a large force of men were employed.

Rope, pulleys, tackle and yawls being placed at suitable points, at a given signal the huge coil slowly unwound, and as the designated point was reached, the cable was anchored on the bottom of the Mississippi river. Every detail decided upon was carried out without a hitch or mishap. Upon the final completion and test, messages of congratulations were exchanged between McGregor and Prairie du Chien, the unanimous verdict of the subscribers to the exchange being that the line is a perfect success.

TELEPHONIC COMMUNICATION BETWEEN EDINBURGH AND GLASGOW.—Arrangements have been made with the Postmaster-General to establish through communication between the National Telephone Company's telephonic exchanges in Edinburg and Glasgow. The arrangement limits this facility in the meantime to eight subscribers—four in each town—who will have the right of calling any member on both exchanges. The subscription will be £110 per annum.

A New Central Office.

Loren N. Downs, General Manager of the Boston and Northern Telephone Company, while in the city yesterday, completed arrangements with the builder, B. D. Stewart, who will at once begin the erection on First street, of a building 20x24 feet, two stories high, just in the rear of Bracewell Block. The building is to be used by the Telephone Company for a central office, and will be, when finished, a model of neatness and convenience. It will contain a waiting room, one sleeping room, private office, and a large operating room. Two switch boards will be used, and suitable enlarged fixtures for an increased number of wires. The business of the company has increased so of late as to render an enlargement of its headquarters in this city necessary. Building will be commenced at once.—*Dover Republican.*

Mr. F. B. Brock, in the *Journal* of the Franklin Institute, describes a mechanical telephone which, without the aid of a battery, transmits and reproduces sounds, loud, clear, and distinct, at long or short distances. It consists of a simple helix surrounding a soft iron core, having no magnetic connection, and acted upon by a thin strip of iron connected with the north or south pole of one or more magnets. The strip vibrates in unison with the transmitting or receiving diaphragm by means of a felt cushion or other connecting medium. This construction, it is said, constitutes a magneto-electric machine or generator, whereby the voice itself produces the current by which the sounds are transmitted to and reproduced by a similar or corresponding instrument at the other end of the line, there being no current in the helix or on the line excepting that so produced, and no other magnetism in the soft iron core inside the former.

M. Eugene Frederic Kæstner, the inventor of the Electrical Thermophone, which has produced such striking effects in Germany and in Paris, died a few days ago at Strasburg after a long illness. He was only thirty years of age. This ingenious and laborious young man was the only son of M. Frederic Kæstner, who has written a number of most interesting works on the music of nature and musical philosophy. It was only owing to the illness of M. Kæstner and his inability to do any work at all for the last few months that his wonderful instrument had not been sent in to the Electrical Exhibitions of Paris and the Crystal Palace, but it is stated that steps will be taken to send it to the Munich Exhibition.

A new dynamo-electric machine, recently brought before the Belgian Academy by M. Plucker, has the peculiarity that a solenoid is substituted for the electro-magnet as an organ for excitation of the induction currents. The horizontal coils of the solenoid, which is of special form, are traversed by the currents produced by the machine itself. The apparatus rotated within the solenoid is a wheel with coils arranged nearly like those of the Gramme ring. The whole system is inclosed in an iron armature meant to increase the inductive action. M. Plucker states that he replaced the solenoid with electro-magnets, and the apparatus produced the same effect. He seems merely to claim the advantage of less weight and volume.

The Southeastern Railway Company have withdrawn their opposition to the underground electric railway, which it is proposed to construct from Charing Cross, at a point near the northwest end of Northumberland Avenue, passing under the River Thames, and terminating at Vine street, under the loop-line station of the Waterloo terminus of the London and Southwestern Railway. The Parliamentary Committee have passed the bill.

At the request of our esteemed correspondent, Dr. Miles, and for the information of Prof. Dolbear and others, we reproduce the following letter, showing another claimant to telephonic honors:

The Telephone a North Carolina Invention.

[From the Raleigh *Observer*.]

Like most of the wonderful inventions of modern times, the telephone is of North Carolina origin, but the inventor of it, like many other inventors—especially North Carolina inventors—is not known in connection with it. It seems to be the fate of genius that its possessor shall never enjoy the fruits of his labors. The following letter written to one of the editors of the *Observer* does but tell the usual story. Dr. Davis, the writer, formerly a resident of Fayetteville, now lives in Salisbury, and is well known in both places. The gentlemen to whom he refers as cognizant of his invention are also well known and of the very highest respectability. The following is the letter;

SALISBURY, April 3.—*Mr. P. M. Hale:* Dear Sir—Believing you to be the champion of the right, I appeal to you to take a little trouble to do justice to a citizen of Fayetteville, with whom you are not entirely unacquainted, and more especially as he who asks this favor at your hands is now, and has been for nearly a year past, an invalid and confined to the house with pulmonary disease. Believing that you will willingly comply with my request, I refer you to an article in your paper of April 3, 1877, respecting the telephone, as it is named by Messrs. Gray, Bell and others. I claim to have invented this "Phonetic telegraph," as I named it, more than ten years ago. At that time I made drawings illustrating fully my invention—but did not proceeed to obtain a patent until I should have perfected the machine.

I refer you to Mr. Jefferson Robinson, of Fayetteville, to whom I described the apparatus, and also to Dr. Haigh of the same place. From the latter gentleman I borrowed, about that time, some works on Anatomy, in order to study and fully acquaint myself with the structure of the human ear, so as to fully understand it, in reference to the working of the "Phonetic Telegraph," as I then called it. I also made pen and ink drawings of the instrument, which I sent to the editor of the *Scientific American*, with a request that they be preserved, as I wished by means of them to claim priority of invention, if my right was disputed. There are many others, all gentlemen of reliability, to whom I can refer. My apparatus was even more perfect than that of Messrs. Gray and Bell, inasmuch as it could write or register the sounds in a distinct language, a thing which they have not yet accomplished. My invention covers the changing of air vibrations into electrical, and the restoring of them again into air vibrations or waves, as is done by these inventors. I have overcome some of the difficulties which they encountered. My apparatus is more perfect than that which they exhibit My state of health alone has prevented my proceeding to establish my claim, to which I can bring many witnesses. I am somewhat surprised that those of my friends with whom I held communication many years ago on this subject should not speak out and do me that justice which should be shown an invalid; but I suppose that so few of our citizens are in the habit of appearing in print that *that* is the reason for their silence.

Now if there is any honor connected with this discovery or invention (it was not a discovery with me). this honor should be assigned to that State of which the inventor was a citizen. Is it not so? At any rate I leave the matter in your hands, satisfied (as I said in the first part of this communication) that it will be a pleasure to you to do justice to one of your old fellow-citizens, and whose health forbids his making any special exertions in his own behalf. I am, I think, sufficiently well known to you to insure your attention to and interest in this matter, and I leave it for the present in your hands. My address is, DR. JAMES DAVIS,

Salisbury, N. C.

The Telephone as a Trifler.

When the history of the telephone is written it will be enlivened by many romantic incidents. A young gentleman in this city is in a condition to furnish one of these. He is engaged in an establishment where the telephone is considerably used, and some time ago he became impressed with the conversation of a person who informed him by the articulate wire that she was engaged as clerk in a business house with which he had frequent occasion to communicate. The head of this house may be called Mr. Smith, chiefly because that isn't his name. The young man became thoroughly enamored of the sweet voice whose tones almost daily come to him, and after a time he begged and obtained an appointment for an interview. Then he put on his purple and fine linen and went down to the store from which the agreeable communications had come. A small boy met him as he went in. "Is Mr. Smith in?" asked the young man—not because he wanted to see Mr. Smith, but because he thought it best not to be too abrupt in his inquiries. "No," said the small boy; "but he'll be in in a minute." The accents of the small boy startled the young man; they were the same that had been almost daily wafted to him along the wire. He immediately said that he would call again to see Mr. Smith, and withdrew in as good order as possible. But he felt that he had had a narrow escape.—*Boston Journal.*

Photo-Zinc and Platinum Process.

Captain Biny proposes to treat with dilute platinum bichloride a polished zinc plate on which a negative image, with all the half tones (taken from a positive) has been impressed by means of coal tar. He finds that a kind of daguerreotype of great delicacy is produced on the zinc, and with exquisite modeling. These prints will be cheaper than the daguerreotypes produced by the deposit of mercury on silver plates. So far as I know—and it will be easy to verify the statement by experiment—the black oxide of platinum is deposited to a greater or less degree on all the parts of the zinc plate that are denuded; the half tones of the image formed by the coal tar will be the resist, and the deposit will be proportional to their intensity. In other words, we shall have an image which, owing to the black color of the oxide of platinum, will be in harmonious contrast with the bright tint of the metallic zinc, and which will be perfectly modeled.—*Scientific American.*

Electric Photo Shutter.

At a recent meeting of the South London Photographic Society, Mr. G. F. Williams exhibited an instantaneous shutter with an electrical liberating attachment, being an efficient trigger, which can be applied to almost any known kind of shutter or exposing valve. It can be converted into either a horizontal or rising shutter by the mere addition of an elastic spring, with a suitable catch or clutch to retain the moving part of the shutter at the end of its travel.

Preliminary measures have been taken for the construction of an electric railway at Tunis. The rolling stock of each train will consist of four cars, each provided with an electric motor and capable of carrying 40 passengers. The cars will be driven by four dynamo-electric machines, lighted by electricity, and stopped instantaneously by electric brakes.

NEW PATENTS—ELECTRICAL—1882.

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING APRIL 18TH, 1882.

257,432. Armature for Magneto-Electric Machines. Franklin H. Beers, Newark, N. J., assignor, by mesne assignments, to the Metropolitan Electric Light and Power Company of the United States, New York. Filed Jan. 11, 1882. (No model.)

257,356. Burglar-Alarm. William D. Matney, Harvel, Ills. Filed Nov. 5, 1881. (No model.)

257,342. Electric Call-Bell Signal. James F. Kettell, Worcester, Mass. Filed Oct. 13, 1881. (No model.)

257,403. Electric Lighting Apparatus. Eli T. Starr, Philadelphia, Pa. Filed Mar. 21, 1882. (No model.)

257,195, Electric Gas-Lighter. William H. H. Whiting, Chelsea, Mass. Filed Dec. 29, 1881. (No model.)

257,188. Electrical Gas-Lighting Apparatus. Thos. H. Rhodes, Brooklyn, N. Y. Filed Nov. 14, 1881. (No model.)

257,233. Electric Signal for Railways. Charles J. Means, Boston, Mass. Filed Nov. 14, 1881. (No model.)

257,165. Insulating Underground Lines. Edward A. Hill, Chicago, Ills. Filed Jan. 28, 1881. (No model.)

257,404. Mechanism for Driving Dynamo-Electric Machines by the Motion of a Moving Vehicle. Eli T. Starr, Philadelphia, Pa. Filed Jan. 31, 1882. (No model.)

257,181. Quadruplex Telegraph. Henry C. Nicholson, Kenton, Ky. Filed May 2, 1881. (No model.)

257,277. Socket for Electric Lamps. Sigmund Bergmann, New York, N. Y. Filed Feb. 25, 1882. (No model.)

257,276. Switch for Electric-Light Circuits. Sigmund Bergmann, New York, N. Y. Filed Feb. 25, 1882. (No model.)

257,146. Shade Holder for Electric Lamps. Sigmund Bergmann, New York, N. Y. Filed Feb. 25, 1882. (No model.)

257,331. Telephone Central Office System. Geo. M. Hopkins, New York, N. Y. Filed Feb. 16, 1882. (No model.)

257,232. Telephone Transmitter. Geo. M. Hopkins, Brooklyn, N. Y. Assignor, by mesne assignments to the People's Telephone and Telegraph Co., of New York.

257,357. Underground Conduit for Electric Wires. Archie F. McGrew, San Francisco, Cal. Filed Dec. 17, 1881. (No model.)

257,298. Wheel for Electro Magnetic Locomotives. Edward N. Dickerson, Jr., New York, N. Y. Filed Jan. 5, 1881. (No model.)

ISSUE OF MAY 2, 1882.

Patents	309—No.	257,143 to No. 257,451 inclusive
Designs	11—No.	12,909 to No. 12,919 inclusive
Trade Marks	9—No.	9,330 to No. 9,338 inclusive
Labels	3—No.	2,673 to No. 2,675 inclusive
Reissues of patents	7—No.	10,098 to No. 10,104 inclusive
Total issue	339	

257,800. Electric Light Regulator. James J. Wood, Brooklyn, N. Y. Filed Feb. 4, 1881. (No model.)

257,499. Multiple Telegraphy. Joseph W. Larish, Buffalo, N. Y., assignor of six-tenths to James W. Tillinghast and Frank Kitton, both of same place. Filed Jan. 20, 1882. (No model.)

257,621. Signalling Apparatus for Telephone Lines. James G. Smith, Hackensack, N. J., and Charles E. Buell, New Haven, Conn., assignors of one-third to George W. Coy, Milford, Conn. Filed Mar. 3, 1882. (No model.)

257,453. Telephonic Transmission of Sound from Theaters. Clement Ader, Paris, France. Filed Jan. 13, 1882. (No model.) Patented in France, Aug. 9, 1881, in Germany Aug. 29, 1881, in Belgium Aug. 29, 1881, in England Sept. 1, 1881, and in Italy Sept. 13, 1881.

257,664. Telephone Exchange System. George W. Coy, Milford, Conn., assignor, by mesne assignments, to the United States Telephone Manufacturing Company, New York, N. Y. Filed Dec. 31, 1881. (No model.)

257,677. Telephone. Thomas A. Edison, Menlo Park, N. J. Filed Oct. 17, 1881. (No model.) Patented in England, June 15, 1878.

257,687. Telephone Transmitter. James P. Freeman, Treat T. Prosser, and Henry B. Prosser, Chicago, Ill., assignors to the Home Telephone Company, of Illinois. Filed Oct. 22, 1880. (Model.)

FOR THE WEEK ENDING MAY 9TH, 1882.

257,683. Alarm for Detecting Defects in Insulating Conductors. Louis Finger, Melrose, assignor of one-half to Lewis S. Judd, New Bedford, Mass. Filed Sept. 28, 1881. (No model.)

257,566. Commutator for Magneto Electric Machines. Arthur H. Eddy, Hartford, Conn. Filed Feb. 10, 1882. (No model.)

257,588. Electric Light Regulator. Nathaniel S. Keith, New York, N. Y. Filed July 27, 1881. (No model.)

257,605. Electroplated Yellow Metal. Andrew O'Neill, New Haven, Conn. Filed July 29, 1880.

257,610. Electric Telephone. Treat T. Prosser and James P. Freeman, Chicago, Ill., said Freeman assignor to the Home Telephone Company, of Illinois. Filed July 21, 1881. (No model.)

258,678. Electric Light. Edgar A. Edwards, Cincinnati, Ohio. Filed Sept. 12, 1881. (No model.)

257,686. Electric Telephone. James P. Freeman, Chicago, Ill., assignor to the Home Telephone Company, of Illinois. Filed July 21, 1881. (No model.)

257,695. Electrical Device for Operating Submerged Mines, etc. George E. Haight, Hartford, Conn., assignor of one-half to Harvey D. Winsor, New Jersey, N. Y. Field Sept. 7, 1881. (No model.)

257,776. Electric Candle. Louis Solignac, Paris, France, assignor to the Jablochkoff Electric Lighting Company, New York. Filed Jan. 4, 1882. (No model.) Patented in France March 7, 1879, No. 129,743.

ISSUE OF MAY 9, 1882.

Patents	384—No.	257,452 to No. 257,835, inclusive.
Designs	8—No.	12,920 to No. 12,927, inclusive.
Trade Marks	15—No.	9,339 to No. 9,353 inclusive.
Labels	4—No.	2,676 to No. 2,679, inclusive.
Reissues of patents	7—No.	10,105 to No. 10,111, inclusive.
Total issue	418	

A printed copy of the specification and drawing of any patent to the annexed list, also of any patent issued since 1865, will be furnished by any of the patent solicitors whose advertisements appear in this journal. In ordering please state the number and date of the patent desired.

New Patents—Great Britain—April and May, 1882.

1867. "Electric arc lamps." A. B. Brown. Dated April 19.

1875. "Secondary batteries." D. G. Fitzgerald, C. H. W. Biggs, and W. W. Beaumont. Dated April 19.

1878. "Dynamo-electric machines." J. H. Johnson. (Communicated by J. M. A. Gerard-Lescuyer.) Dated April 19.

1884. "Improved methods or processes of separating metals and metalloids from thin ores and other substances by means of electricity." W. R. Lake. (Communicated by E. Marchese.) Dated April 19.

1895. "Electric lighting and incandescent lamps." P. M. Justice. (Communicated by A. Cruto.) Dated April 20.

1896. Telephonic and telegraphic signalling apparatus." A. C. Brown and H. A. C. Saunders. Dated April 20.

1901. "Voltaic batteries." A. R. Bennett. Dated April 21.

1915. "Electric lamps." W. T. Whiteman. (Communicated by M. Bauer & Co.) Dated April 22.

1919. "Electric arc lamps." J. Lea. Dated April 22.

1940. "Electric batteries." W. R. Lake. (Communicated by L. Maiche.) Dated April 24.

1945. "Improvements in the arrangement of and in the mechanism for telephone alarms or individual calls." W. Morgan-Brown. (Communicated by J. F. Kettell.) Dated April 25.

1946. "Construction of secondary batteries." C. V. Boys. Dated April 25.

1956. "Electric batteries and apparatus and means connected therewith." T. J. Handford. (Communicated by B. Jarriant.) Dated April 25.

1994. Mechanical Telegraphs for use on board ship, which improvements are applicable also to various other purposes. W. Chadburn. Dated April 27.

1999. Improved means of accumulating and storing electric currents, and in economically utilizing the energy so stored for lighting purposes. J. B. Rogers. Dated April 27.

2020. Apparatus or means for obtaining electric light. J. C. Asten. Dated April 28.

2030. Electric switches or circuit changers. Hon. R. Brougham. Dated April 28.

2037. Manufacture of electric incandescent lights in the vacuum. A. L. Jousselin. Dated April 29.

2044. Dynamo electrical machines. Hon. R. Brougham. Dated April 29.

2052. Improvements in electrical generators and engines, and in apparatus or means for regulating generators of electricity. T. J. Handford. (Communicated by T. A. Edison.) Dated May 1.

2065. Improvements in microphonic conductors or contacts, and in the preparation of materials for such conductors or contacts. J. H. Johnson. (Communicated by A. D'Arsomal.) Dated May 2.

2068. A new or improved secondary battery. C. H. Cathcart and C. B. G. Cole. Dated May 2.

2072. Electric lights. T. J. Handford. (Communicated by T. A. Edison.) Dated May 2.

2092 Electric light apparatus. C Lever. Dated May 3

2107. "Improvements in electric safety apparatus for theatres, warehouses, and other structures made applicable automatically in case of fire." P. Jensen. (Communicated by R. J. L. Haviland.) Dated May 4. Complete.

2123. "Regulating and utilizing electric currents." W. Arthur. Dated May 5.

2125. "Improved method of producing electric currents for general purposes." K. Parzelski. Dated May 5.

2135. "An improved process for forming or preparing lead in the shape of plates or otherwise for secondary batteries or magazines of electricity and an improved construction of battery." T. Cuttriss. (Partly communicated by C. Cuttriss.) Dated May 6.

2136. "Incandescent lamps." J. Rapieff. Dated May 6.

2138. "Apparatus for producing electric currents, also applicable for electro-motive power purposes." A. Millar. Dated May 6.

2144. "Electric lamps." J. H. Johnson. (Communicated by J. M. A. Gérard-Lescuyer.) Dated May 6.

2184. "Electro-magnetic and magneto-electric engines." C. F. Varley. Dated May 9.

2185. "Electro-magnetic and magneto-electric engines." C. F. Varley, Dated May 9.

2186. "Incandescent electric lamps. H. Lea. Dated May 9.

The Last Train.

[James R. Keith, station agent at West Roxbury, passed on May 2.]

When the train passed, that finally doth take
All men as passengers from day to day,
He saw one friend and then another leave
His station for a station far away.

As baggage, some took this thing, some took that,
Old creeds and dogmas, mere professions some
Of love and goodness; his was kindly deeds,
Memories of these for his eternal home.

When the conductor beckoned him to go,
He was all ready. On the platform stood
A host of friends who mourned to see him leave,
He'd been to them so kind, so patient, good,
"All right," was heard, and then the train moved on;
"Good-by," from us, and our dear friend was gone.

JOHN S. ADAMS.

Magnetic Properties of Steel and Iron.

Many investigations upon the relation between the molecular conditions of iron and steel produced by heat, by torsion, and by annealing processes, and the resulting changes in magnetic conditions, have been made. It appears from the paper of Louis M. Cheesman that the effect of mechanical hardening has not been properly investigated, and this paper contains the results of his investigation upon this point. The method of research consisted simply in determining the magnetic moment of the magnetic bar after it has been subjected to well-devised mechanical pressures. The result of his investigations is summed up as follows: Iron in a mechanically hard condition can receive more permanent magnetism than in a soft condition. The magnetic moment of a steel magnet in a mechanically hard condition is greater or smaller than in a soft condition, according as the ratio of its diameter to its length is less or greater than a certain limit.—*Ann. der Physik und Chemie.*

Statistics of population compared with representatives in the legislative bodies of the leading countries of the world show that the United States, with the largest population, has the smallest number of legislators. For her nearly fifty millions of people she has 369 Senators and members of Congress, while the figures for European nations are these: Germany, 45,000,000, and 397 Delegates; England, 34,000,000, and 658 members of Parliament: France, 36,000,000, and 950 Representatives and Senators; Spain, 17,000,000, and 387 Deputies in the Cortes; and Austria-Hungary, 35,000,000, and 1,609 members in the two houses.

Another electric railway, which is the second there, has just been constructed in Berlin and formally opened. It has a grade of 1 in 30, which is perhaps the steepest incline in the country. The motive power is led to the cars by two thin wire ropes, about 25 centimeters apart, and attached to the telegraph poles. These wires are capable of propelling one small eight-wheeled carriage. Compared with the first line, the system used in this, while more complex, secures greater economy in the use of the current.

The estimated total length of all the submarine telegraph cables in the world is 62,100 miles, and their money value is computed at $200,000,000. According to the estimates of a French statistician the total length of all the telegraph wires at present laid is sufficient to reach forty-six times around the world

Phosphor bronze has an electric conductivity two and half times that of iron or steel, and one-third that of copper.

The tariff for cable messages from New York and Canada to Great Britain, France and Germany, advanced on May 22 to 50 cents per word.

Dynamo Electric Machines.

We extract from *Nature*, of April 27th, the following note: "A new dynamo-electric machine, recently brought before the Belgian Academy by M. Plucker, has the peculiarity that a solenoid is substituted for the electro-magnet as an organ for excitation of the induction currents. The horizontal coils of the solenoid, which is of special form, are traversed by the currents produced by the machine itself. The apparatus rotated within the solenoid is a wheel with coils arranged nearly like those of the Gramme ring. The whole system is inclosed in an iron armature meant to increase the inductive action. M. Plucker states that he replaced the solenoid with electro-magnets, and the apparatus produced the same effect. He seems merely to claim the advantage of less weight and volume.

Electrical Engineering.

In connection with the Crystal Palace Company's School of Art, Science, and Literature, is added a department for the preparation of those entering the electrical engineering profession. Professor W. E. Ayrton distributed the certificates to the students of this school last Saturday week, and addressed the assembled students in a speech which was listened to with great attention. He informed them that it is no more possible to learn electrical science out of a book than it is possible to acquire proficiency in bicycling in an arm chair; and that, in a word, while an ordinary course of lectures will teach a good deal about the electric light, it will require as systematic a course of training as that of other professions to succeed as an electrical engineer.

Schoolmarms in Idaho.

When we had finished with the climate, soil, and productions of Idaho, one of the group asked:

"How about education facilities?"

"That's the only thing we lack," replied the old man, with a mournful sigh "We've got schools enough, but we can't keep no teachers."

"What's the trouble?"

"Well, take my school, for instance—only two miles from the nearest house, eminently situated on the top of a hill, and paying the highest salary. We can't keep a teacher over two weeks."

"Do they die?"

"Some do, though it's no place for dying. We had a young fellow from Ohio, and he met a grizzly and whistled for him. The grizzly cum. We had another, and a widder run him down and married him inside of a month. The third one was lame, and the Injuns overtook him. Then we tried women folks. The first one got married the night she lit down there; I took the second about the middle of the third week, and the next one was abducted by a stage robber."

"Why don't you get the ugliest, homeliest woman you can find – some perfect old terror, like that lantern-jawed, razor-faced female over by the ticket window?"

"Why don't we? Stranger, you Eastern folks will never understand us pioneers in the world—never. That's my wife—the identical school-teacher I married, and she was the handsomest one in the drove."
—*Detroit Free Press.*

Brush vs. Faure—Secondary Batteries.

The Brush Electric Company, of Cleveland, give notice to all parties proposing to invest under the Faure Secondary or Storage Battery patent that priority of invention is claimed by Charles F. Brush; that he has an application for patent now pending, and in interference with the Faure Patent; that his evidence of priority of invention is complete and decisive, and that the Brush Electric Company will push the interference case with the utmost possible diligence, and, after obtaining the patent, proceed in the courts to have the Faure patent annulled. Particulars may be learned from Causten Browne or William C. Witter, of counsel, No. 32 Park Place, New York

New Electric Arc Lamp.

An improved electric arc lamp, lately patented by Mr. Henry B. Sheridan, of Cleveland, O. This lamp emplcys two or four carbon rods converging toward the point of combustion, and allowed to gravitate toward each other by a friction escapement, controlled by a differential magnet placed in a shunt circuit, and affected by the fluctuations of the current.

The carbon rods are suspended by chains from drums of different diameters, the positive carbon being connected with the chain from the larger drum, and the negative carbon being connected with the chain from the smaller drum, so that, notwithstanding the difference in the rate of the consumption of the two carbons, they always maintain the arc at the same point.

The construction is such that a strong current holds the carbons apart, and by means of a pawl and ratchet arrangement the feeding device separates them more or less, when the current is very strong; as, for example, when the carbons touch previous to lighting. In this case it separates them to form the arc, after which the regulation is accomplished for the greater part by releasing the arms as the current weakens, allowing the carbons to approach sufficiently to maintain the standard length of the arc.

Richard King, known all over Texas and the West as "The Cattle King," is a small, swarthy Irishman, with a limping gait. His lameness is due to the careless way in which a broken leg was set. His flocks of sheep and goats, his herds of cattle and his troops of horses and mules are estimated at 500,000 head in all. His ranche, the Santa Gertrudas, is seventy-five miles in length, and includes nearly the whole of two counties in Southwestern Texas.

We are glad to note the activity and prosperous condition of the business of almost all manufacturers of telegraph and telephone apparatus and electrical supplies. The daily increasing volume of business in this trade denotes the growing interest that the public are rapidly taking in all things of an electrical nature. We have had occasion to speak of Western Electric Company, the Bishop Gutta percha Works, and Messrs. Holmes, Booth & Haydens. We would lso mention in this connection the large establishment of Messrs. Post & Co., of Cincinnati, O., chiefly manufacturers of all kinds of telephone apparatus and supplies. So great has been the demand in this country and Europe for their new improved wire-protected rubber band magneto bells that they are to-day nearly two thousand behind their orders; but their recently increased facilities are now enabling them to handle this vast volume of business more rapidly.

Western Union Stock closed at 84¼.

American Dist. Tel. Stock 47.

BANNING & BANNING,

PATENT ATTORNEYS

AND

SOLICITORS,

21 Park Row, NEW YORK. Honore Building, CHICAGO.

THOMAS D. STETSON,

Solicitor of American & Foreign Patents and Expert in Patent Cases.

Trade-Marks and Labels Registered.

23 MURRAY STREET, NEW YORK.

ESTABLISHED 1855.

BURKE, FRASER & CONNETT,

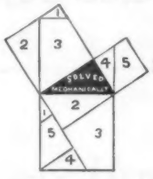
SOLICITORS OF PATENTS,

10 Spruce Street, New York.

Electrical inventions a specialty. Inventors should send for specimen of "PATENTS ON INVENTIONS," our Quarterly Circular of information and advice.

ELIOT & ELIOT,

SOLICITORS OF PATENTS,



AMERICAN AND FOREIGN

BOUGHT AND SOLD.

PATENT LAW

A Specialty.

40 & 41 Astor House, New York.

CONNOLLY BROS. & McTIGHE,

PATENT ATTORNEYS

AND

SOLICITORS.

Electrical Cases a Specialty.

91 GRANT ST., PITTSBURGH, PA.

914 F STREET, WASHINGTON, D. C.

—AND—

1001 CHESTNUT STREET, PHILADELPHIA, PA.

PATENTS.

ELECTRICITY a specialty.

Patents procured for inventors in the United States and Foreign Countries. Send for circular.

A. M. PIERCE,

Office, 82 Astor House, New York City.

WILLIAM LUSK,

Designer & Engraver

ON WOOD,

7 MURRAY STREET,

(NEAR BROADWAY)

Room 54. NEW YORK.

Estimates given on Wood Engraving of every description.

EUGENE F. PHILLIPS,

MANUFACTURER OF PATENT FINISHED

Insulated Telegraph Wire,

TELEPHONE AND ELECTRIC CORDAGE,

ELECTRIC LIGHT WIRE,

MAGNET WIRE, PATENT RUBBER COVERED WIRE,

Burglar Alarm and Annunciator Wire, Lead Encased Wire, Anti-Induction, Aerial and Underground Cables, etc.

OFFICE AND FACTORY,

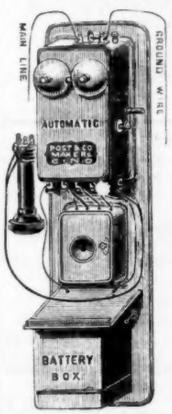
67 Stewart Street, Providence, R. I.

W. H. SAWYER, Electrician and Superintendent.

Telegraph & Telephone Department.

POST & COMPANY,

CINCINNATI, OHIO.



LICENSED MANUFACTURERS OF

American Bell Telephone Co.'s

MAGNETO AND ELECTRO

CALL BELLS, &c.

Manufacturers of all kinds of

Telephone Instruments,

Bells, Plugs, Switch Boards, Annunciator Drops, Spring Jacks, Magneto Engines for Switch Tables, and dealers in all kinds of *Telephone Supplies* and Tools; in stock and for sale at lowest prices.

Galvanized Line Wire, all numbers; Insulated Wire, all numbers; Insulators and Brackets, all sizes; Batteries, all kinds and sizes, at lowest prices.

FULL ASSORTMENT OF

Telegraph Instruments,

Agents and Managers of Exchanges are requested to correspond with us before purchasing.

☞ We call special attention to our new improved Magneto Call Bells. Samples sent on application to Agents and exchanges.

POST & CO., Cincinnati, O.

JOHN M. PATTERSON,

Patent Broker,

Telephonic and Electrical Apparatus

A SPECIALTY.

91 GRANT STREET,

PITTSBURGH, PA.

THE "WATERBURY"

One Every Minute,

Six Hundred Daily

Are being manufactured and sold by the

WATERBURY WACTH CO.

WATERBURY, CONN.

Send for Circular.

NEW YORK OFFICE, - - 4 MAIDEN LANE.

GEO. MERRITT, Agent.

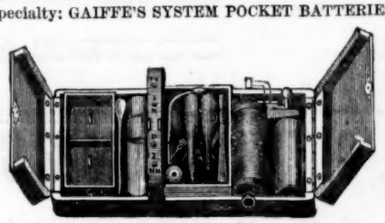
E. W. WAGNER,

Manufacturer of

ELECTRO-MEDICAL APPARATUS.

Specialty: GAIFFE'S SYSTEM POCKET BATTERIES.

Send for Catalogue and Prices.



Awarded First Medal at Cincinnati Exposition, 1880.

36 John Street, New York.

"Phosphor-Bronze."

Phosphor-Bronze Telephone Wire,

COMBINES HIGH ELECTRICAL CONDUCTIVITY AND RESISTANCE TO CORROSION WITH LIGHTNESS AND TENACITY.

Standard Sizes, 16, 17 and 18, Stubs' Gauge.

ADDRESS:

THE PHOSPHOR-BRONZE SMELTING CO., Limited,

512 ARCH STREET, PHILADELPHIA, PA.

Owners of the United States Phosphor-Bronze Patents, Sole Manufacturers of Phosphor-Bronze in the United States.

J. H. LONGSTREET,

MANUFACTURER OF

Telegraph and Telephone Supplies

OF EVERY DESCRIPTION.

9 Barclay Street,

NEW YORK.

THE

CONSTANT CURRENT ELECTRIC GENERATOR,

MANUFACTURED SOLELY BY THE

CONSTANT CURRENT CURE CO.,

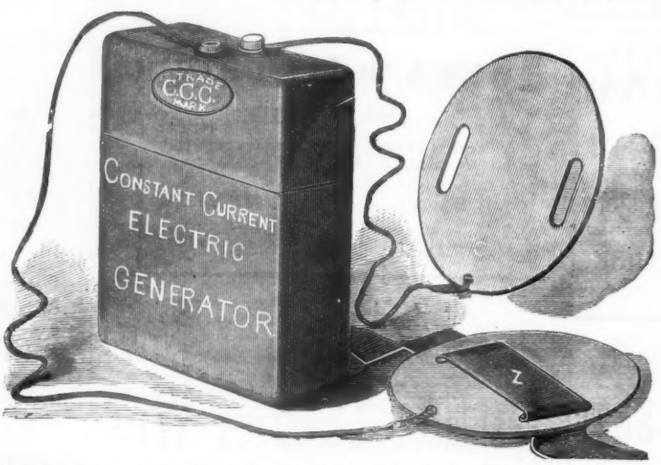
207 MAIN STREET, BUFFALO, N. Y.

This powerful yet simple and compact generator develops a continuous, mild electric current, capable of passing entirely through the human body, affecting every organ, nerve, and tissue, producing marked curative effects.

This current, although so subtle and permeating, is not perceptible to the senses, yet it will operate a galvanometer through a resistance of 5,000 ohms, equal to a telegraph line over 300 miles long.

One of the most remarkable features of this generator, is that it will develop a current continuously for a year with no other attention than the addition of a few drops of water occasionally, and if after long use the chemicals with which it is charged become exhausted, its charge may be renewed for ten cents.

An eminent electrician of New York city says: 'Your constant current electric generator possesses three features which render it superior to any electro-medical apparatus yet brought to my notice: 1 It generates a constant and available current. 2. It is perfectly portable, having no free solution that can be spilled. 3. It continues in working order longer than any other form of battery known." Such is the testimony of one who has had years of experience in all branches of electrical science.



The Constant Current Electric Generator

is sent anywhere, by mail, on receipt of the price, $3.00, or by express C. O. D. with collection charges added, with the privilege of examination, but it will add materially to the cost. Inclose 10 cents for registration, and we will guarantee safe delivery of the Generator by mail.

All remittances should be by Postal Money Order, by Draft, or by Registered Letter. We will not be responsible for money sent us in an ordinary letter.

Address the

CONSTANT CURRENT CURE CO.,

207 MAIN STREET, BUFFALO, N. Y.

L. G. TILLOTSON & CO.

Manufacturers Importers and Dealers in

RAILWAY

TELEGRAPH & TELEPHONE

SUPPLIES

OF EVERY DESCRIPTION,

Nos. 5 & 7 Dey Street,

NEW YORK.

Photographic Instruments

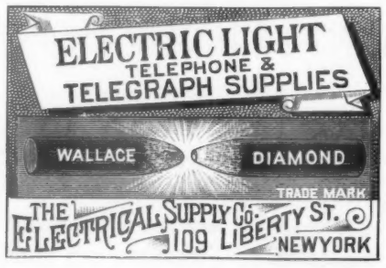
The Art of Photography

Complete without a Teacher.

From $6.00 up; send 10c. for Circular and Catalogue, to

AUGUST HERZOG, 36 John St., N. Y.

Manuf'r of Photo. Instruments.



Waterbury Brass Co.

MANUFACTURERS OF

SHEET BRASS, BRASS RODS,

—AND—

Pure Copper Wire

—FOR—

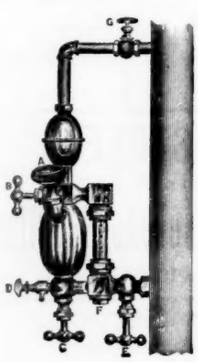
ELECTRICAL PURPOSES.

DEPOTS:

296 BROADWAY, NEW YORK.

125 EDDY ST., Providence, R. I.

Mills at Waterbury, Conn.



THE HOLLAND LUBRICATOR,

Patented July 5, 1881.

MANUFACTURED BY

HOLLAND & THOMPSON,

TROY, N. Y.

For lubricating the Valves and Cylinders of Engines. This is the only Lubricator operating with a downward drop. We do not use the transparent water chamber, which so many parties claim to be the inventors of. A sample will be sent to any responsible party, on 20 days' trial. We do not effect sales by threats, but depend on the merits of our Lubricator.

☞ Why do you suffer the annoyance of hot journals and dripping of oil when you can use our

Oline Compound

For all kinds of Machinery. Also Manufacturers of

Graphite Grease,
Axle Grease and
Gear Grease.

HOLLAND & THOMPSON,
242 River Street,
TROY, N. Y.

H. Prentiss & Company,

AGENTS,

42 Dey Street, NEW YORK.

DYNAMO MACHINES.

ELECTRICAL BOOKS.

Send name and address for a complete catalogue of Works on Electicity,

ELECTRIC LIGHT AND ELECTRIC TELEGRAPH.

D. VAN NOSTRAND,

23 Murray and 27 Warren Sts., New York.

MITCHELL'S PHONOGRAPHY

A Scientific System of Sound and Sight Writing.

110 Pages, printed on super calendered paper. Cloth sides.

$1.00 PER COPY.

The CHEAPEST and BEST Book on SHORT HAND WRITING published.

C. W. PRATT, Publisher,

73–79 Fulton St., New York.

*** Sent free by mail on receipt of price.

BOOKS.

DESCRIPTIVE CATALOGUE,

90 pages—of Books relating to Applied Science, including books on

Electricity, Electric Light, Electric Signals,

Burglar Alarm and Call Bells, Telephones, &c.,

SENT FREE ON APPLICATION.

E. & F. N. SPON, 44 Murray Street, N. Y.

If you desire to keep pace with the daily progress and development of Telephone, Telegraph, and Electrical matters, have a copy of the

NEW YORK REVIEW

OF THE

Telegraph and Telephone

sent to your address.

Only $2.00 per annum.

Address all communications intended for this paper to

GEORGE WORTHINGTON, Editor and Proprietor,

No. 23 PARK ROW,

P.O. Box 3329, NEW YORK.

WESTERN

ELECTRIC MANUFACTURING COMPANY,

220-232 KINZIE ST., CHICAGO.

62-68 NEW CHURCH ST., NEW YORK.

MANUFACTURERS OF

Telegraph Instruments

AND SUPPLIES.

Insulated Copper Wires, Electric Bells and Annunciators, Burglar Alarms, the Electro-Mecurial Fire Alarm, Electro-Medical Apparatus, Electric Gas-Lighting Apparatus, Edison's Electric Pen and Duplicating Press, the Gamewell Fire Alarm Telegraph Apparatus, Bi-Polar and Carbon Telephones, Telephone Exchange Apparatus, Underground Cables.

ANSON STAGER, President. ENOS M. BARTON, V-Prest.

ELISHA GRAY, Electrician.

CATALOGUES

Sent by mail on receipt of price in stamps or currency.

	Pages.	Price.
I—Complete Set of Catalogues	236	20c.
II—Telegraph Instruments and Supplies	64	6c.
IV—Insulated Wire (included in II).		
V—Electric Bells, Annunciators, Electro-Mercurial Fire Alarm	32	3c.
VI—Electro-Medical Apparatus	32	
VII—Manual of Telegraphy and Catalogue of Private Line Instruments	32	free.
VIII—Condensed Price List	20	free.
X—Electric Bells, etc Descriptive	12	3c.
XI—Magnets for Mills	20	3c.
Sir Wm. Thomson's Nautical Instruments	24	5c.

EXTRACTS FROM

CHORDAL'S LETTERS.

One of the most interesting books for manufacturers, mechanics, or business men ever published. A great variety of mechanical and business topics treated in a wise and witty way that will be instructive to old and young, and interesting to every body.

The book contains 320 pages, 12mo, and over 40 Humorous Illustrations.

PRICE, $1.50 PER COPY; BY MAIL TO ANY ADDRESS.

ROSSITER W. RAYMOND, says of this book:

This book contains a selection from the articles which have appeared under the same title, during the last two years, in the columns of the *American Machinist*. The series is still going on, and no reader of that excellent journal wishes to have it brought to a close. For pithy wisdom and keen wit, applied to mechanical and technical topics, but couched in terms intelligible to all readers, it would be hard to find the equal of these sprightly practical, discursive "Letters." Their lack of plan is even more apparent in book-form than in that of their original publication. They are the shop-talk of a shrewd observer and practitioner, and belong to the same class in literature with "The Autocrat of the Breakfast Table," or the various "Table Talks" of great men. Indeed, the author has consciously or unconsciously caught the spirit of Holmes's famous book, and employing in another field the same method, has produced a highly entertaining and instructive commentary upon the ways and work of machinists.

In examining this republication of the sayings we had already noticed occasionally at their former appearance, we have found ourselves, in the first place, led to read the book through to our great amusement and profit; and in the second place, we have thought of a dozen persons to whom we would like to send it. Some of them are firemen; some are journeymen; some are young fellows who are hankering after machinery, and no very distinct idea of what the machinist's trade involves; some are graduates of technical schools, who need the plain talk which a book can give them without offense, and thus save them from hearing it less pleasantly from human lips; some are neither actually, perspectively, nor retrospectively machinists or mechanical engineers; but they know how to enjoy a clever satire, with a core of common sense, and therefore they would relish Chordal.

We do not mean to say that we agree with all the opinions expressed by Chordal. Why should we? He takes no special pains to agree with himself. At different times he presents different sides, with happy disregard of what he may have said earlier or may choose to say later. But what he does say is worth learning, laughing at, and then thinking over.

PUBLISHED BY

American Machinist Publishing Co.

96 FULTON ST., NEW YORK.

This paper will be devoted to the sole purpose of keeping you conversant and thoroughly posted on all topics of an electrical nature, which may be brought out from time to time, in this country and Europe.

WM. DAWSON & SONS,

EXPORT STATIONERS,

Indian and Colonial Agents,

BOOKSELLERS & NEWSVENDERS,

Sole Agents for Great Britain for the

NEW YORK REVIEW

—OF THE—

Telegraph & Telephone,

AND ELECTRICAL JOURNAL,

SUBSCRIPTION RATE, 10s. Per Annum.

No. 121 CANNON STREET,

LONDON, E. C., ENGLAND.

THE

Inventors' Record and Industrial Guardian,

A SCIENTIFIC JOURNAL

For Patentees, Manufacturers, Engineers, Etc.

Subscriptions 15s. per annum, 7s. 6d. half-yearly, 3s. 9d. quarterly in advance.

23 ROOD LANE, LONDON, ENGLAND.

J. A. BERLY'S

BRITISH AND CONTINENTAL

Electrical Directory

AND ADVERTISER,

FOR 1882,

IS NOW PUBLISHED AT

J. A. BERLY'S, 16 New Bridge St., London, E. C.

PRICE, FIVE SHILLINGS ($1.25.)

By Post—Registered—5/6 ($1.35.)

Firms in the U. S. and Canada desirous of their names and addresses appearing in the next issue (1883) *should at once communicate with the publisher, supplying him with particulars, prospectus, catalogue, etc.*

All persons ordering articles advertised in our columns will do us and our advertisers both a great favor by mentioning that they saw the advertisement in this paper.

Entered according to Act of Congress, in the year 1882, by George Worthington, proprietor and publisher, New York, in the office of the Librarian of Congress, at Washington, D. C.

WESTERN ELECTRIC MANUFACTURING CO.

CHICAGO AND NEW YORK.

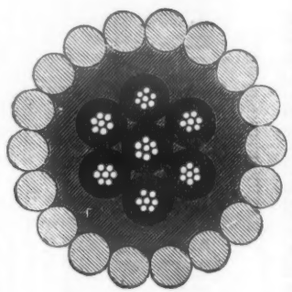
Telegraph and Telephone Apparatus and Supplies.

THE BEST OF EVERYTHING AT BOTTOM PRICES.

220—232 KINZIE STREET, CHICAGO. 62—68 NEW CHURCH STREET, NEW YORK.

THE BISHOP Gutta-Percha Works

(SAMUEL BOARDMAN, Agent)



Original and only Manufacturers in the United States of GUTTA-PERCHA INSULATED

Submarine Telegraph Cables,
50 Regular Sizes—One to Ten Conductors.

Subterranean Telegraph Cables,
Hempen-Armored Covered.

Aerial Telegraph Cables,
Lead or Hempen Covered.
ANTI-INDUCTION

Telephone (Lead-Covered) Cables,
as used by the Metropolitan Telephone and Telegraph Company.

Torpedo Cables,
Recommended by the European and South American Governments.

Lead-Covered Cables,
For Canal and Streamlet Crossings.
GUTTA-PERCHA

OFFICE WIRE, FUSE, LEADING AND CONNECTING WIRE,
For Subaqueous, Mining and all other Electrical purposes.

MARK'S COMPOUND INSULATED WIRE,
For Office, Outdoor, Underground and Battery Use.

G. P. OFFICE WIRE, COTTON-COVERED.

ALSO HAVE ALWAYS ON HAND

WIRES OF EVERY VARIETY OF INSULATION,
Magnet Wire, Telephone Flexible Cords, Flexible Elevator Cables, Electric Cordage,

BURGLAR-ALARM AND ANNUNCIATOR WIRE,
Electric Light Wire, Cordage and Cables, Lead-Covered Wire, and Every Description of

PURE GUTTA-PERCHA GOODS,
Gutta-Percha Sheet, for Cable Splices; G. P. Chemical Vessels for Acids, etc.

Agents for Reception of Orders and Sale of Goods:
L. G. TILLOTSON & CO., 5 and 7 Dey Street, New York.
WILLIAM HEATON, 503 Chestnut Street, Philadelphia.

Thirty-three years' experience has taught us that neither the electrical nor mechanical qualities of either GUTTA-PERCHA or copper deteriorate by long working or submersion, consequently the best form of a submarine telegraph cable will be that in which these conditions are fulfilled.—*Extract from Report on Cables, by Willoughby Smith.*

Manufactured by
The Bishop Gutta-Percha Works.
Address all communications to
W. W. MARKS, Superintendent,
490, 492, 494 and 496 East 25th Street, New York.
OFFICE AT THE WORKS.

HOLMES, BOOTH & HAYDENS,

MANUFACTURERS OF

SHEET BRASS, BRASS WIRE, RODS AND TUBING, COPPER RIVETS AND BURS.

Pure Lake Superior Copper Wire

FOR ELECTRICAL PURPOSES.

Patent "K K" Insulated Copper and Iron Wire.

THE IRON IS SPECIALLY ADAPTED FOR TELEPHONE USE.

Prof. HENRY MORTON says:—"I have tested it with "Ozone," which concentrates the atmospheric influences of years into an hour, and find that it stands this thoroughly."

No. 49 Chambers Street, New York. **No. 506 Commerce Street, Philadelphia.** **No. 18 Federal Street, Boston.**

WORKS AT WATERBURY, CONN.